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## **Hooked! - Player Engagement in Digital Games as a Driver in Interactive Storytelling, Learning Scenarios and Teaching**

Schønau-Fog, Henrik

*Publication date:*  
2012

*Document Version*  
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Schønau-Fog, H. (2012). *Hooked! - Player Engagement in Digital Games as a Driver in Interactive Storytelling, Learning Scenarios and Teaching*.

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# HOOKED!

**Player Engagement in Digital Games  
as a Driver in Interactive Storytelling,  
Learning Scenarios and Teaching**

**HENRIK SCHØNAU FOG  
DOCTORAL DISSERTATION**

# Hooked!

## Player Engagement in Digital Games as a Driver in Interactive Storytelling, Learning Scenarios and Teaching

Henrik Schønau Fog

Doctoral Dissertation  
submitted in partial fulfilment of the requirements for the degree of  
Doctor of Philosophy

Department of Architecture, Design and Media Technology  
Aalborg University  
Copenhagen, Denmark

Summer, 2012

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To my loved ones,  
here and now, there and then.

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Henrik Schønau Fog  
Department of Architecture, Design & Media Technology  
Section of Media Technology  
Aalborg University Copenhagen  
A.C. Meyers Vænge 15  
2450 Copenhagen  
Denmark  
[hsf@create.aau.dk](mailto:hsf@create.aau.dk)

# Abstract

This dissertation explores the concept of engagement, i.e. how it can be described in interactive media and digital games, how it can be evaluated and how it can be applied, not only in interactive experiences such as interactive storytelling, but also while learning and teaching serious, educational and purposeful content.

Currently, there exists a variety of research on how games entertain and why players have fun while playing. The concept of engagement is used in different ways in the literature and has been associated with numerous other concepts such as enjoyment, flow, presence, immersion and fun. However, few investigations focus on player engagement as a desire to continue playing in digital games. One of the main premises of this project is that the ‘continuation desire’ is a motivating factor, which may be exploited in order to drive users through various kinds of ‘non-game’ and ‘non-fun’ interactive experiences, for example purposive interactive emergent narratives and educational applications with a serious content.

In order to address the problem in further detail, this project focuses on three investigative themes.

Firstly, the concept of engagement in interactive media experiences is investigated by means of explorative research and grounded theory, with a focus on the aspect of player engagement in digital games. This part empirically identifies a range of causes of the desire to continue playing and conceptualises a player engagement framework, which can be used to design, analyse and evaluate interactive media experiences. In the framework, player engagement is described as a process consisting of objectives, activities, accomplishments and affect. A player may thus experience a desire to continue when performing a range of activities, in order to accomplish either extrinsic objectives defined by the game or player-defined intrinsic objectives, whilst at the same time experiencing affect.

Secondly, the acquired knowledge is utilised to develop two methods for evaluating engagement: a ranking method and the intrusive method, the latter of which introduces an Engagement Sampling Questionnaire for evaluating engagement during runtime in interactive media.

Thirdly, the practical use of the player engagement framework and the evaluation methods are exemplified by applying the findings to a range of purposes.

A prototype of an interactive narrative application concerned with being a victim of war is designed and evaluated using the intrusive method. The results indicate that users may become engaged in an experience, even though the content is non-pleasurable. In addition, the use of this interactive experiential learning application is investigated in the context of a classroom setting. The findings suggest that there is potential for using such applications as a supplement for learning in schools.

Furthermore, an investigation into problem-based game design and innovation indicates that the player engagement framework may be beneficial as a teaching aide, which in turn could potentially help teachers better understand – and improve – the motivation of their students during course and project work.

In conclusion, the prospective uses of the contributions are described by presenting a range of opportunities to further explore the concept of engagement in interactive media in future design and research endeavours.

## Summary in Danish

Denne afhandling udforsker begrebet 'engagement' ved at undersøge, hvordan det kan beskrives i relation til interaktive medier og spil, hvordan det kan evalueres, og hvordan engagement kan anvendes, ikke alene i interaktive oplevelser såsom interaktiv historiefortælling, men også som motivator i undervisning og under indlæring af seriøst og meningsfuldt indhold i interaktive applikationer.

For tiden eksisterer der en bred vifte af forskning i, hvordan spil underholder og hvorfor spillere har det sjovt, mens de spiller. Begrebet engagement bruges ydermere på forskellige måder i litteraturen og er blevet forbundet med en lang række andre begreber såsom nydelse og 'at have det sjovt' samt koncepterne flow, presence og immersion. Der er dog færre undersøgelser, der fokuserer på spillerens engagement som en lyst til at fortsætte med at spille. En af de vigtigste forudsætninger for dette projekt er, at denne 'lyst til at fortsætte' er en motiverende faktor, som kan udnyttes til at drive brugere gennem forskellige former for 'ikke-spil' og 'ikke-sjove' interaktive oplevelser. Dette kan for eksempel være interaktive emergente fortællinger med et formål samt undervisningsapplikationer med et seriøst indhold.

Dette projekt fokuserer på tre forskningsmæssige temaer med henblik på at undersøge dette felt yderligere.

For det første vil begrebet engagement i relation til interaktive medieoplevelser blive undersøgt med fokus på spiller-engagement aspektet i digitale spil ved hjælp af en eksplorativ tilgang, der bygger på 'Grounded Theory'. Denne del identificerer via empiri en række årsager til lysten til at fortsætte med at spille og konceptualiserer en spiller-engagement model, der kan anvendes til at designe, analysere og evaluere interaktive medieoplevelser. Spiller-engagement kan derved beskrives som en proces, der består af mål, aktiviteter, resultater og affekt. En spiller kan således opleve lysten til at fortsætte, når han eller hun udfører en række aktiviteter med henblik på at nå enten ekstrinsiske mål, defineret af spillet, eller spiller-definerede intrinsiske mål, mens han eller hun på samme tid føler affekt.

For det andet vil den indsamlede viden blive anvendt til at udvikle to metoder til evaluering af engagement: en rang-ordnings metode, og den intrusive metode. Sidstnævnte introducerer et 'Engagement Spørgeskema' som kan anvendes til at evaluere engagement under afviklingen af interaktive medier.

For det tredje bliver den praktiske brug af spiller-engagements-modellen og evalueringsmetoderne eksemplificeret ved at anvende dem til en række formål.

Som eksempel er en prototype af en interaktiv fortælling, der formidler en førstehånds-oplevelse af at være et krigsoffer, blevet udviklet og evalueret med den intrusive metode. Resultaterne viser, at brugere kan blive engagerede i oplevelsen, selvom indholdet ikke er 'sjovt'. Desuden er anvendelsen af dette interaktive læringsscenarie blevet undersøgt i forbindelse med klasseundervisning på tre forskellige skoler. Resultaterne tyder på, at der er et potentiale for at bruge sådanne interaktive oplevelser som et supplement til læring i folkeskoler og gymnasier.

En undersøgelse af problem-baseret spil-design og -innovation viser endvidere, at spiller-engagement modellen kan være gavnlig som et pædagogisk værktøj, der potentielt kan hjælpe lærerne til bedre at forstå - og øge - motivationen af deres elever under kurser og projektarbejde.

De potentielle anvendelser af afhandlingens bidrag indeholder en vifte af muligheder for at udforske begrebet engagement yderligere indenfor interaktive medier; både indenfor design og i forskningsøjemed.



# Preface

This dissertation is submitted in partial fulfilment of the requirements for the Ph.D. degree in Media Technology at the Department of Architecture, Design and Media Technology (AD:MT), Aalborg University.

The doctoral work has been performed at the section of Medialogy, with Professor Lise B. Kofoed as supervisor.

This project documents work carried out between September 2007 and April 2012. During this period, 40% of the time was allotted to functioning as a lecturer, supervisor and semester coordinator on the Bachelor and Master Medialogy educations at the AD:MT department.

Summer, 2012

Copenhagen

Henrik Schønau Fog

# Acknowledgements

Many fantastic people have been involved in this project in one way or another, and without them this project would not have been as inspiring to work on as it has been over the last few years.

First of all, I would like to express my gratitude to my supervisor, Professor Lise B. Kofoed for her great support and for always having the time to discuss my project and ideas whenever required. Professor Emeritus Erik Granum also deserves thanks for helping me in the initial phases of the project and for his guidance in the later stages of my research.

I am also thankful to the Department of Architecture, Design and Media Technology at Aalborg University, Copenhagen for giving me the opportunity to pursue my research interests by providing me with a doctoral dissertation scholarship.

I am moreover deeply grateful to Faysal Fuad Khalil and Jawid Faizi, both M.Sc.'s from Medialogy, for their contributions and hard work while developing and testing the First Person Victim prototype – without you this project would not have been nearly as engaging.

I also want to thank all my current and former colleagues – ‘no one mentioned, no one forgotten’ – at the Department of Architecture, Design and Media Technology for helping me in one way or another and for the many fruitful discussions we have had during the duration of the project.

Thanks also go to the Master and Bachelor students in Medialogy, who were always willing to answer a never-ending series of questionnaires, to try out some of my ideas, and who enthusiastically debated the many facets of engagement, games and interactive stories with me: you know who you are.

Furthermore, this project has been deeply inspired by the people I have met along the way at conferences, visits and courses. In particular: Associate Professor Jonas Linderoth, Department of Education at the University of Gothenburg, for his strict, constructive and always good-humoured feedback; Keith Oatley, Professor Emeritus of Cognitive Psychology at the University of Toronto, for fruitful and encouraging conversations about my findings; Professor Carrie Heeter, Telecommunication, Information Studies, and Media, Michigan State University, for her belief in the First Person Victim project; Associate Professor Erik Maaløe, Department of Business Administration, Århus University, for his inspirational ways of approaching research; Associate Professors Espen Aarseth and Gordon Calleja, both at ITU, Copenhagen, for their valuable feedback at conferences and during the Ph.D. course ‘Games, Stories and Worlds’, as well as game design veteran and interactive storytelling pioneer Chris Crawford for paving the way. Furthermore, acknowledgments also go to researchers from the GAMBIT lab at Massachusetts Institute of Technology for inviting me to share my research and for the stimulating feedback, which supported my ideas.

Much appreciation also goes to my friends for their endurance when they had to wait to see me due to a seemingly endless line of looming deadlines. Warm, heartfelt thanks also go to my companion for her unending patience and intriguing, yet constructive questions about my project and to the angel-bandit for her playful fantasy and personal assistance in developing the framework.

Last but not least I extend my gratitude to my family and parents for their everlasting support on this journey and to my brothers, architect Morten Schønau Fog and film director Peter Schønau Fog, who deserve recognition for many valuable discussions and helpful feedback along the way.

Thank you all....

# Papers included in the Dissertation

Papers will be referred to by their roman numbers.

- I. The Player Engagement Process – An Exploration of Continuation Desire in Digital Games.  
Schoenau-Fog, H. (2011). In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.  
*Conference proceedings paper – presented at Think Design Play: 5th International DiGRA Conference (Digital Games Research Association). September, 2011. Utrecht.*
- II. Hooked! Evaluating Engagement as Continuation Desire in Interactive Narratives.  
Schoenau-Fog, H. (2011). In: Si, M., Thue, D., André, E., Lester, J., Tanenbaum, J., Zammitto, V. (eds.) ICIDS 2011. LNCS, vol. 7069. pp. 219–230. Springer, Heidelberg. ISBN: 978-3-642-25288-4.  
*Conference proceedings paper (Best student paper award) – presented at The Fourth International Conference on Interactive Digital Storytelling. Vancouver, November, 2011.*
- III. Authoring for Engagement in Plot-Based Interactive Dramatic Experiences for Learning.  
Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2012). In: Transactions on Edutainment IX. Springer, Heidelberg. ISSN: 1867-7207  
*Journal article (Accepted for Publication)*
- IV. First Person Victim: Using Interactive Drama and Tragedy to create Awareness about the Consequences of War.  
Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2010). In: Meaningful Play 2010: Designing and Studying Games that Matter – Online Conference Proceedings. Michigan State University, East Lansing.  
*Conference proceedings paper – presented at Meaningful Play conference, Michigan State University, East Lansing, October, 2010.*
- V. Teaching Serious Issues through Player Engagement in an Interactive Experiential Learning Scenario.  
Schoenau-Fog, H. (2012). In: Mitgutsch, K., Wimmer, J., Rosenstingl, H. (eds.), Eludamos. Journal for Computer Game Culture. Vol. 6, no 1, pp. 53-70. ISSN: 1866-6124.  
*Journal article. (Top paper award) – Project presented at Future and Reality of Games Conference. Vienna, 2011.*
- VI. Using Problem Based Learning and Game Design to motivate Non-technical Students to engage in Technical Learning.  
Reng, L., Schoenau-Fog, H. (2010). In: GAME PLAY SOCIETY : Contributions to contemporary Computer Game Studies. eds. / Christian Swertz ; Michael Wagner. München : Kopaed VerlagsGmbH, 2010. pp. 27-39. ISBN 978-3-86736-240-5  
*Conference proceedings paper as book chapter – presented at Future and Reality of Games Conference. Vienna, 2010.*
- VII. Problem Based Game Design - Engaging Students by Innovation.  
Reng, L., Schoenau-Fog, H. (2011). In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.  
*Conference proceedings paper – presented at Think Design Play: 5th International DiGRA (Digital Games Research Association) Conference. September, 2011. Utrecht.*

## Other related papers not included in the dissertation

- First Person Victim: Developing a 3D Interactive Dramatic Experience.  
Schoenau-Fog, H., Bruni, L., Khalil, F., Faizi, J. (2010). In: Aylett, R., Lim, M.Y., Louchart, S., Petta, P., Riedl, M. (eds.) ICIDS 2010. LNCS, vol. 6432, pp. 240–243. Springer, Heidelberg. ISBN 978-3-642-16637-2.  
*Conference proceedings paper – Demo and poster presented at The Third International Conference on Interactive Digital Storytelling, Edinburgh, November, 2010.*
- Player Engagement Evaluation as an Iterative Game Development Method.  
Birke, A., Schoenau-Fog, H., Reng, L. (2012). MindTrek Conference. Tampere, Finland, 2012.  
*Conference paper (submitted)*
- Coffee Tables & Cryo Chambers: A Comparison of User Experience and Diegetic Time between Traditional and Virtual Environment-Based Roleplaying Game Scenarios.  
Tempte, B. F., Schoenau-Fog, H. (2012). The Fifth International Conference on Interactive Digital Storytelling. San Sebastian, Spain. 2012  
*Conference paper (submitted)*
- Project Aporia - An Exploration of Narrative Understanding of Environmental Storytelling in an Open World Scenario.  
Bevensee S. H., Boisen K. A. D., Olsen, M .P., Schoenau-Fog, H. (2012). The Fifth International Conference on Interactive Digital Storytelling. San Sebastian, Spain. 2012  
*Conference paper (submitted)*



# Organisation of the Dissertation

This dissertation consists of three main chapters, namely an introduction chapter, a contributions chapter and a chapter consisting of discussions and conclusions. These chapters document my work on this research project and are structured around seven papers, all of which have been peer-reviewed and published in international journals and conference proceedings.

The introduction in Chapter I presents the motivation for the project as well as the background, the main problem and the primary objectives. Related research questions and the methodology used to address the research questions are also presented here.

In Chapter II, the contributions and descriptions of the papers are organised into three themes based on the overall research question: What is engagement in interactive media and digital games and how can it be evaluated and applied? The contributions of the papers are thus organised into the following three main parts: explicating engagement, evaluating engagement and applying engagement. Each part also includes reflections and discussions on each contribution.

The first part, Section 2 in the contributions chapter, explains how a conceptual and theoretical framework of ‘continuation desire’ has been developed, before moving on to describe the process of player engagement in more detail (Paper I).

In Section 3, two engagement evaluation methods are presented in the second part. A ranking method is described in Paper I, and in Paper II an intrusive method aimed at evaluating engagement as ‘continuation desire’ during runtime is introduced.

In the third part, Sections 4 to 7, the framework and the evaluation method are used to exemplify four concrete applications of the findings. First, the design of an interactive storytelling application is described through a case study of the ‘First Person Victim’ (FPV) prototype. Additionally, engagement in the FPV, as well as the potential for using it as a tool for learning, is evaluated by means of the intrusive evaluation method and the framework (Papers II–V). The third part concludes with a presentation of how the player engagement framework can be used to analyse student engagement when utilising game design and innovation as motivational drivers (Papers VI, VII).

Finally, the contributions, methods and work within the project are reflected upon in Chapter III, where perspectives are discussed and future work is laid out before the final conclusions are presented.

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<b>Appendix I: Papers</b>	

# I Introduction

The development of media technologies aimed at creating interactive environments with advanced and realistic audio-visual capabilities is accelerating. New input devices are frequently being introduced to the market, and over the past decade digital games have become part of mainstream entertainment.

Now, imagine the kinds of experiences and communicative artefacts that would be possible if you combined the interactive audio-visual media technology and engaging properties of digital games with storytelling in interactive environments.

In this project, I am inspired fundamentally by these possibilities and the potential for harnessing the engaging qualities of digital games, in order to exploit them as drivers for a variety of applications such as interactive storytelling experiences with a serious content, as well as for motivating students in the context of teaching.

## 1 Motivation

At the beginning of this research project, I set out on a quest to conceive practical design strategies that would aid in the creation of engaging interactive stories. This PhD project was thus initially motivated by the problems and challenges related to the creation of interactive stories in virtual worlds.

Much previous work addressing the problems of interactive storytelling in games and interactive media has focused on how to transform traditional linear narrative structures into non-linear experiences, where users or participants encounter narratives, as if they were the main actor in the narrative (e.g. Glassner, 2004). However, many of these attempts have resulted in rigid, linear, branching tree-like structures due to the use of traditional plot-based storytelling and the major challenges of interactive storytelling: the ‘narrative paradox’ and the ‘combinatorial explosion’ (more about these challenges in the next section).

Even though there are problems in the creation of interactive storytelling, there are great possibilities in mediating technologies. Ever since the first introduction of digital games, the audio and visuals in game media have become of a higher and higher quality with every single release. And with the advent of more accessible authoring tools and game engines (e.g. Unity, 2012) aimed at creating experiences in 3D environments, much more flexible methods of creating interactive narrative audio-visual experiences are



possible. This means that there is now an opportunity (at least from a technological point of view) to create another class of artefacts, which use these engines to communicate a variety of novel narrative experiences.

However, technological achievements are often used by the mainstream interactive entertainment industry to engage users through basic, although very powerful, means like fun and enjoyment. Many of these interactive experiences are frequently based on engagement forms that include simple challenges requiring hand-eye coordination, which may lead subsequently to tactical immersion (e.g. Adams and Rollings, 2007) This may typically occur when players are shooting enemies in some of the most popular video game categories, which, according to the entertainment software association (ESA, 2011), currently include the shooter, fighting and action genres.

The problems of interactive storytelling, the possibilities of the game and media technologies and the triggering of engagement in mainstream games sparked my interest in going in another direction: combining the engaging qualities of games with interactive narrative experiences that are not based on ‘concealed’ linear storytelling while simultaneously communicating serious topics. However, this idea added yet another problem to the classic pitfalls of interactive storytelling, namely how does one sustain user engagement during such experiences?

In order to explore how a combination of engagement and narrative structures can provide users with types of experiences other than those dominating the interactive entertainment industry today, it thus becomes necessary to investigate the concept of engagement in more depth. My motivation is thus based on the idea that it is possible to use conventions from digital games and the player experience of engagement as a motivational driver in other kinds of interactive experiences.

The overall aim of this project is therefore:

**To explore empirically the concept of player engagement in digital games, in order to use the findings as a driver in interactive storytelling applications, learning scenarios and teaching.**

# 2 Background

In order to provide an overview of the fields of interactive narratives and engagement, the following sections will describe the background of the problems related to interactive storytelling and the concept of engagement in interactive experiences.

## 2.1 Interactive Storytelling

Digital games have become increasingly popular as an entertainment medium over the past three decades. While the mainstream hype of head-mounted displays and Virtual Reality (VR) entertainment have slowly decreased since the heydays in the 1990s, the advent of games with realistic, real-time 3D worlds and characters has embraced the promise of interaction in fictional story-worlds where the first generation of virtual worlds in VR left off.

During the same period, traditional, so-called interactive movies on laserdiscs, DVDs and cinema projections reached their limitations and lost their novelty value. Most of the experiences in this type of interactive narrative media are in fact very linear, as ‘interactivity’ is often limited to choosing between different, predefined paths, which are then shown as full-motion video sequences. However, the advent of digital video resulted in a range of video streaming sites on the internet. One of them – YouTube (2012) – offers ‘video annotations’ which make videos clickable, and this option has sparked a renewed interest in interactive movies, although the constraints and limitations are still the same as in the first interactive film ‘Kinoautomat’ (Činčera, 1967), due mainly to the fact that film media is a linear experience and the production process in film and video is very time-consuming and inflexible after shooting or recording has taken place.

Meanwhile, interest in creating narrative content for interactive worlds has steadily increased and a new cross-disciplinary field of study has arisen – research into interactive experiences with narratives, drama and storytelling (Szilas, 2005).

The field has developed momentum, not only due to improved audio-visual and real-time possibilities in the interactive media, but also it has been fuelled by the entertainment industry’s craving for new forms of interactive digital entertainment and games with strong storylines (e.g. *Heavy Rain*, 2010; *Fahrenheit*, 2005; *The Last Express*, 1997). Also, researchers’ attempts to build systems that can create narratives with the ability to change according to users’ feedback have moved the field forward (e.g. *Façade*, 2002).

In most digital games ‘embedded’ narratives (Jenkins, 2004) are usually scripted and therefore also very linear, as the user has to follow a predefined progressive path (mostly branching structure) in the adventure game genre.

An old dream is to use ‘computers as theatre’ (Laurel, 1993) and to create “Hamlet on the Holodeck” (Murray, 1998). However, the concept of ‘Interactive Storytelling’ is problematic due to the fact that stories conventionally are authored and experienced as linear chronological structures, while interactivity provides users with the chance to perform various actions in a non-linear and essentially unpredictable fashion.

A major challenge of creating interactive storytelling in virtual environments and games is thus concerned with conveying a logical, structured story while participants who

are experiencing the narrative are still able to roam freely in an interactive world. Traditionally the relationship between interactivity and storytelling has been seen as inversely proportional (e.g. Adams, 1999; Juul, 1999; Riedl & Stern, 2006). Juul (2001; 1999), for example, investigates this clash between stories and interaction, in relation to games, and states conclusively “There is an inherent conflict between the *now* of the interaction and the *past* or ‘*prior*’ of the narrative. You can’t have narration and interactivity at the same time; there is no such thing as a continuously interactive story” (Juul, 2001, p 10). This statement and others like it prompted much debate in the early 2000s between ‘ludologists’ and ‘narratologists’, the first group stating that games are not stories (although they can contain stories), the second group arguing that games *are* stories. Debate or not, the question still remains: Is it possible to create a system which can organise events in a structure resulting in an interactive narrative, so that the experience of the user is that of a free and dramatic one?

A great deal of research has already been conducted in the field of the interactive narrative. Attempts to create theories and/or prototypes have been carried out with the origin of the plot-based Aristotelian structure (Laurel, 1993) followed by the Neo-Aristotelian structure which adds interactivity to the equation (Mateas, 2002, p. 26).

Other theories and structures have been applied in the field, for instance Propp’s work on formalizing Russian folktales to a meta-structure of narrative elements (Propp, 1968). In addition, Campbell’s work (1949) on systematising the world’s myths as cyclical diagrams (e.g. ‘The hero’s journey’) has been used as a source of inspiration in both interactive stories and Hollywood films (Vogler, 2007).

The research addressing these more ‘traditional’ narrative theories has resulted in various artefacts and prototypes, all of which attempt to solve the challenge of interactive storytelling – often with limited success. The majority of the research in narrative structures has been based on time causality (for example, a three-act structure with a beginning, a middle and an end). The same principle prevails in the rather orthodox narrative structures of mainstream Hollywood films, which suggests that the common understanding of a traditional narrative among conventional scriptwriters and audiences is that it is strictly structured and based on a cause and effect relationship in chronological time (e.g. Field, 1982).

Perhaps this is what prompted earlier attempts to address the various problems of interactive storytelling to focus on how to translate traditional linear narrative structures into non-linear experiences, where users follow the story as the main character. However, many of these attempts are still using concealed and rigid branching structures, like the first interactive movies, as a result of using traditional plot-based storytelling and inherent causal relations between events.

As already mentioned, an experience structured in a *linear* fixed time causality clashes with *non-linear* freedom in interactive worlds, so this approach seems to have shown little progress and promise. Consequently, a detailed analysis of the above theories will not be repeated in this project, as the contributions of this research project are intended to inspire the creation of new formats and experiences.

### 2.1.1 The Narrative Paradox and Emergent Narratives

In order to attempt to solve the previously mentioned problems involved in developing interactive storytelling applications, two major challenges need to be addressed: the ‘narrative paradox’ and the ‘combinatorial explosion’.

In the academic field of interactive storytelling, the problem of having an author-controlled narrative and a free roaming virtual environment at the same time is well-established and labelled the ‘narrative paradox’ (e.g. Louchart and Aylett, 2003). It is considered the ‘Holy Grail’ of future interactive storytelling by many artists and researchers (e.g. Mateas and Stern, 2005). The narrative paradox describes this problem by stating that the majority of narratives – as we know them from traditional linear mainstream media – are pre-authored as a more or less fixed linear (plot) structure before the narrative is experienced. The designer is therefore confronted by a potential paradox whereby either the participant’s agency or freedom of interactivity is reduced or the traditional linear structure of the narrative risk is disrupted while the participant is interacting within the environment.

Contemporary researchers in the field consider the concept of ‘emergent narratives’ a possible solution to the challenge of solving the narrative paradox (Aylett, 1999; Louchart et al., 2008a; Louchart et al., 2008b). The concept of an emergent narrative is based on an approach which is inspired by interactive theatre, improvisational performances and live role playing. Furthermore, it is generated as a result of the interaction between characters, and the story develops out of characters’ relationships and the user’s investigation of these associations (e.g. Louchart, 2007; Aylett et al., 2006).

In Jenkins’ interpretation, “[e]mergent narratives are not pre-structured or pre-programmed, taking shape through the game play, yet they are not as unstructured, chaotic, and frustrating as life itself” (Jenkins, 2004, p. 128). In addition, on the construction of these types of narratives, “game spaces are designed to be rich with narrative potential, enabling the story-constructing activity of players” (Jenkins, 2004, p. 129).

Some researchers have designed and developed emergent narrative concepts that are highly non-linear, experimenting with and implementing a variety of applications such as ‘Fear Not!’ (Aylett et al, 2005), ‘Dear Esther’ (Pinchbeck, 2008), and ‘Façade’ (Mateas and Stern, 2005). These examples illustrate that there is potential in the emergent narrative approach.

Abbott’s concept of ‘overreading’ (Abbott, 2008) provides clues as to the reason why emergent narratives have the potential to form a coherent narrative whole for the user, even if events are not causally related:

“Overreading is a phenomenon that is frequently cued by the master plots in which our fears and desires are most engaged. It is what allows some people to flesh out an incident involving inexplicable lights in the night sky with a chain of events involving extra-terrestrial beings. It is what allows others to load up a stranger with an unflattering moral character, cued only by the color of his skin. Our minds seem to abhor narrative vacuums. We try to fill them in” (Ibid., p. 89).

In other words, interactive emergent narratives can make use of seemingly non-related embedded events in an environment, because users continuously create their own stories based on the encountered events.

In addition, Oatley (2011) argues that it is possible to see stories as simulations:



“Narrative stories are simulations that run not on computers but on minds. For complex matters we may know how each part works, but we may need something like a simulation to see how the parts fit together in combination” (Ibid., p. 17)

This could be compared with the embedded events in an emergent interactive narrative, in which case the simulation coupled with overreading will provide the story’s construction, which connects the events and the gaps in the story to form a user-generated narrative. It follows that I concur with Oatley, when he states:

“For writers and performers the task is not only to be true to nature, or to imitate life, or to mirror the world accurately, although these aspects are nearly always important. It is to invite the reader or audience member to start up a dream. It is to offer the cues to the reader to consider an allegory, to offer the instructions to world-making that will help make the simulation run and sustain itself” (Ibid., p. 17).

### 2.1.2 The Combinatorial Explosion

Nevertheless, even if the emergent narrative concept is a promising viable alternative approach towards solving the narrative paradox, content still needs to be produced to create environments with narrative potential. Another challenge occurs when users roam an interactive story world; there is a need for novel events to happen. If there are too few interesting events and/or the environment lacks stimuli, there is a risk that the experience may become less engaging after a short period of time. Conversely, if there are too many causally related events, the producers of the events will face an almost impossible challenge to produce all possible branches of the story.

This challenge is described as the ‘combinatorial explosion’ (Stern, 2008), as it can become a very demanding and time-consuming task to manage and produce content for all possible events and scenes in a free-roaming interactive story world. In such an environment every new choice may result in the exponential growth of possible new choices, and thereby new events and scenes. This problem thus needs to be addressed in order to solve how to create engaging interactive narrative experiences.

### 2.1.3 Sustained Engagement

According to Jenkins (2004), any interactive environment with events will provide the possibility of story construction activity among participants. Furthermore, it will offer an opportunity for overreading, as stated by Abbott (2008), as well as the possibility of a range of stories generated through simulation by the users themselves, which is in line with Oatley (2011).

Nevertheless, the problem lies not only in how to structure these events, and thus lay out the narrative possibilities for dramatic experiences, but also there is a need to utilise a driver other than the causal relations between events, in order to avoid the combinatorial explosion.

An even more important problem for authors and designers of interactive stories is how to sustain engagement among users while they navigate in and interact with the virtual environment. Even if solving this problem is a crucial prerequisite for a successful

interactive narrative, addressing this challenge may be neglected, and indeed it could result in less engaging experiences.

In summary, the main challenges in interactive storytelling are how to organise events and interactive elements in a free-roaming world so that the narrative is conveyed and the user's freedom to interact is maintained while engagement is sustained. The endeavour to develop such experiences can perhaps best be compared to the role of a theatre director who is trying to direct a live play while members of the audience are taking part as the main actors – not only must she ensure that the narrative is conveyed to the participants, she must also attempt to keep them engaged.

If it is possible to use engagement and conventions from digital games as the main driver in emergent narratives, the need to create a lot of events and interactive elements might be reduced. Moreover, if the user is engaged by other factors than the storyline, it might be possible to support a degree of freedom of interactivity while maintaining the ability to communicate a narrative theme. For these reasons, the question of how to *sustain engagement* in emergent narratives based on embedded events in an open-ended virtual environment is thus the main focal point of this part of the study.

This dissertation will not seek to offer definitive solutions to the challenges presented by the narrative paradox or the combinatorial explosion. Instead, it is motivated by the exploration of alternative approaches to traditional drivers such as the linear progression of the narrative or pre-programmed causal relations between events. The investigation is thus founded on the challenge of how to harness the user's engagement in digital games as an alternative driver in interactive narratives, while communicating a serious theme, as opposed to more light-hearted themes that are often found in mainstream interactive entertainment.

One specific aim of the project is thus to investigate the following problem:

<p><b>How can engagement be sustained among users in more serious forms of interactive narrative experiences than those traditionally related to games?</b></p>
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## 2.2 Engagement in Interactive Experiences

In order to exploit the triggers of engagement and harness the engaging qualities inherent in interactive media for the development of alternative forms of engaging interactive experiences and other purposes, it is necessary firstly to get an overview of the concept of engagement.

### 2.2.1 Overview of Engagement

Engagement is a broad term used in a number of diverse fields such as in marketing (customer engagement), the military (as in “engaging the enemy”), education (student engagement), broadcast media (e.g. viewer engagement) and employee engagement, to name a few. The concept is thus used in multiple areas, the understanding of the term differs and the descriptions vary.

As interactive media develops into an increasingly important factor in both mainstream entertainment and communication, new ways of becoming engaged in a media experience have been added to the spectrum of traditional media experiences such as film, TV and print. Engagement in interactive media is thus a multifaceted concept, which is used among both laymen and scholars to describe powerful user experiences with interactive media. Even though engagement may be an essential element of a successful user experience in interactive experiences and games, there seems to be no common understanding of how the term is used. Gamers, designers, scholars and reviewers use the expression in various ways when describing user experience in games or when evaluating interactive experiences. For example, I have discussed the concept of engagement with a variety of game designers and scholars, and some of them make a comparison between engagement and, for instance, a ‘fun’, enjoyable or pleasurable experience. Although, I agree that engagement is a necessary component of such experiences, I do not concur with the notion that engagement always equals these types of experiences, and I believe that a successful interactive experience first and foremost needs to be engaging and not necessarily ‘fun’.

Therefore, before investigating engagement in the academic literature, a starting point could be to gain a basic understanding of the meaning of engagement, and then expand the generic definition to interactive media. I will thus initiate the exploration by describing my understanding of how the generic definitions of engagement can be related to interactive experiences based on the terms ‘engagement’ and ‘engage’ (Merriam-Webster, 2012).

Engagement in interactive media can be the experience of a certain state of mind whereby the media engages the user through interactivity and the experience of the media itself. In order to become engaged, the user has to participate and be greatly interested in the experience. When a user becomes engaged, there is full involvement and commitment to the experience. While being engaged the user may also be preoccupied and busy with the activity, in which case her attention can be held to a degree, which in turn can lead to engrossment. The term ‘engage’ additionally means to begin and to carry on an activity, and when engaged, the user is committing him- or herself to continue the activity for a longer period of time. Furthermore, several dictionary terms that are similar or related to the concept of engagement could also apply to an interactive experience: absorption, engrossment, fascination, immersion, involvement, captivation, obsession and preoccupation (Ibid.) Finally, the dictionary offers a surprisingly relevant – although obsolete – explanation of the concept: “To entangle or entrap in or as if in a snare or

bog” (Ibid.). That is, the experience of engagement in interactive media can sometimes feel like being ‘caught’ or ‘stuck’ in the experience.

Although a dictionary may help one to provide an initial idea of how the concept of engagement can be explained, the above definitions, descriptions and synonyms highlight how complex and multifaceted understanding this phrase can be when relating the concept to interactive media.

User experiences have already been researched both theoretically and empirically, and the common understanding in the academic literature is that engagement can be explained as one dimension of the user experience. However, the facets or aspects of engagement in interactive media and games have been described in a multitude of ways, most likely because it is an academic field that includes a variety of scholars with diverse backgrounds. When reviewing the specific academic literature about users’ experiences of interactive media, it thus becomes evident that engagement has also been used in relation to other concepts to describe various qualities of an interactive experience. Several studies have thus associated engagement with other concepts and aspects, such as motivation (e.g. Przybylski et al. 2010; Malone and Lepper 1987), immersion (e.g. McMahan 2003; Brown and Cairns 2004; Jennet et al. 2008), flow (Csikszentmihalyi 1990) and gameflow (Sweetser and Wyeth 2005). Others associate engagement with involvement and incorporation (Calleja 2011) as well as presence (e.g. Lombard and Ditton 1997; Tamborini and Skalski 2006). Finally, some scholars also link engagement to various positive emotions and feelings such as fun (e.g. Koster 2004; Poels et. al, 2007), pleasure (Costello and Edmonds 2009), and enjoyment (Klimmt 2003).

These studies each include various elements of what could be a more complete picture of what engagement in interactive experiences actually entails. Since engagement is so closely related to these concepts and theories concerned with the user experience, I conducted a literature review in the initial phases of the project, in to get an overview of the related theories. The essential findings and main concepts and theories are described in more detail in Paper I.

These concepts might explain what motivates people to begin using an interactive medium in general, what types of feelings a user might encounter during an experience or what the outcome of an engaging experience might be. Some of the concepts may also lead to an engaging experience in themselves (e.g. motivation, involvement), while others possibly could be the result of engagement (e.g. immersion, flow, fun enjoyment, pleasure and incorporation).

Nonetheless, the literature about these concepts seems not to focus explicitly on what in the medium drives the user through an experience, what is in the experience that makes us become engaged or to what degree.

In other words, the current literature seems not to be sufficient enough to provide a foundation for investigating the different causes and triggers of engagement. For this reason I argue that, in order to further understand the user experience, it is necessary to investigate one additional aspect of engagement, namely what it is that makes users want to continue with an interactive media experience. Consequently, another challenge of this project revolves around exploring the following problems:

<p><b>How can engagement in interactive experiences be described, and how can the triggers and causes of engagement be identified empirically?</b></p>
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## 2.2.2 Digital Games, Player Engagement and Continuation Desire

It can be argued that playing digital games is one of the most engaging interactive media experiences available today, and as digital games increasingly become a form of mainstream entertainment media, it is therefore relevant for this project to investigate how this relatively recent form of entertainment engages its users.

In games, players can encounter a wide range of engaging experiences, while the experience of engagement is very evident and can be very powerful. The most popular digital games have the ability to draw people in (Jennett et al., 2008), make people want to keep playing (Brown and Cairns, 2004), they glue players to the game (Rigby and Ryan, 2011), and they have extraordinary holding power (Ermi and Mäyrä, 2003). This desire to keep playing an interactive digital game is a strong motivator, which can be very different from the motivation to carry on reading a book or keep watching a film.

Therefore, it makes sense to use digital games as the field of study when investigating this aspect of engagement by conducting an exploration of player engagement.

In addition to the related concepts mentioned earlier – which, depending on the nature of the game played, may or may not be included in the engagement dimension of the player experience – player engagement will be understood in this project as the willingness experienced during game play to keep playing, or the desire to come back and play a game again and again over a longer period of time. This study is thus not concerned with the motivation and the question of *why* people play in general (see e.g. Klimmt, 2003; Yee, 2006; Klug and Schell, 2006; Sherry et al., 2006; Ryan et al., 2006; Rigby and Ryan, 2011).

In order to add another aspect to the investigation of engagement, and to furthermore narrow the focus of this project, I have chosen to investigate one aspect of the multifaceted concept of player engagement in digital games in more detail, by introducing the concept of ‘continuation desire’.

The desire to continue could be argued to be a prerequisite for any engaging interactive experience, and the determination, tenacity, persistence and perseverance to continue experienced by an engaged player may thus be the fundamental drivers for player engagement. Therefore, the foundation of engagement in interactive media and digital games could basically be understood as the desire to continue an experience, in which case it is an essential facet in this research paper.

Since the beginning of this project there has been a steady increase of interest in studying the player experience, so the field has become a moving target. Although Brown and Cairns (2004) originally suggested that engagement is experienced when players want to keep playing, the concept of ‘continuation desire’ is an aspect of player engagement in digital games which seems not to have been explored completely. Consequently, to the best of my knowledge, it seems that no comprehensive empirical, detailed investigation of the determinants of the desire to continue in digital games currently exists.

The investigation conducted within this project will thus mainly be concerned with the continuation desire facet of engagement, and will therefore not focus on related aspects such as fun, enjoyment, presence, immersion, flow and motivation. Moreover, many of these terms and concepts are not well-defined in and by themselves, as for example when Jennett and colleagues (2009) state “there is a discrepancy amongst the research community in terms of what immersion actually is” (Jennett et al., 2009, p. 3408). However, Paper I includes a discussion of the relations between continuation desire and some of its closest related concepts.

This investigation will therefore focus on describing situations which occur when a player is motivated to play, wants to continue to play and/or wants to come back to play.

Consequently, another challenge of this project is to address these research problems by asking the following question:

**What are the categories and components of continuation desire in a digital game experience, and how can the findings be used to develop a conceptual and theoretical player engagement process framework?**

### 2.2.3 Evaluating Engagement

Since engagement could be argued to be a fundamental element of any successful interactive experience, it would be valuable to devise a method which can be used to evaluate the subject. However, when investigating how related concepts are evaluated and measured, for example immersion and flow, the problem is that they are quite elusive and are ‘broken’ if one attempts to investigate them during the experience through interruptions. Therefore, many investigation methods which attempt to evaluate or measure users’ experiences of these related concepts are often conducted as post-experience evaluations, in which case some information might be lost.

Nevertheless, it can be argued that the continuation desire element of player engagement may be encountered before, during and after interaction with a game. Consequently, post-game questionnaires will thus not suffice if a detailed assessment of engagement during runtime is required.

Additionally, it seems that no method exists for evaluating the *continuation desire* element of engagement in detail *during* interactive experiences or *while* playing games by acquiring quantitative measurements and qualitative data.

There are a variety of measurements and conceptualisations concerning the description of the multifaceted concept of player experiences. So far though, no common categorisation exists, although a number of attempts have been made to address this point. Paper II describes some of these studies in general, and in the following some of them are explained in more detail while a few other relevant approaches are also introduced.

Mayes and Cotton (2001) propose a construct, which they label ‘engagement’, that determines the quality of a video game experience. The concept is conceived based on the “outcome that is desired most by game developers: an enjoyable game” (Ibid., p. 692). The authors define engagement as “how fun, involving, and motivating a task is” (Ibid.) Moreover, they describe an ‘Engagement Questionnaire’ (EQ) intended to investigate five dimensions of engagement (interest, authenticity, curiosity, involvement and fidelity) which are thought to influence a player’s level of engagement while playing a digital game. The investigation in this study is concerned with respondents’ favourite and least favourite games and does not cover in-game or runtime investigations of the aspect of continuation desire.

Busselle and Bilandzic (2009) furthermore introduce a scale for measuring narrative engagement. This scale distinguishes between four dimensions of experiential engagement in narratives: narrative understanding, attentional focus, emotional engagement and narrative presence. However, there is no mention of the desire to continue the experience of the narrative in this study.

Another study describes the ‘Playtest Method’ (Davis et al., 2005) whereby players play for one hour and are then immediately asked standard quantitative questions concerned with various aspects of the player experience. These questions include items

such as overall fun, graphics, controls, story, sound and other play elements that are part of the game, in order to compare games quantitatively. Additional game-specific, quantitative questions are also asked and open-ended questions can be used if needed to gain additional feedback about the player experience. This method is concerned with investigations happening after the first hour of gameplay and is designed to gather mainly quantitative information about players' perceptions of games, in order to make games more fun. However, a game does not necessarily need to be fun in order to be engaging, so it is also essential to evaluate if a player wants to continue and/or try the game again.

The TRUE (Tracking Real-Time User Experience) evaluation method devised by the same research group automatically collects gameplay feedback about player experience during the entire game (Schuh et al., 2008). In addition to player behaviour data and what players do in the game, this method also uses in-game surveys and pop-up questions to collect data about opinions and feelings. The surveys are divided into three different categories (Ibid, p. 244):

- a) Event-based surveys, which are displayed when various events of interest occur, e.g. the completion of a mission, a player's death or the solving of a puzzle. Event-based surveys are useful for investigating the experience that was concluded with the event.
- b) On-demand surveys, which the player can bring up anytime they want in order to provide feedback, for example when they spontaneously want to indicate when they feel bored, lost, confused or happy.
- c) Time-based surveys, which appear after a certain amount of time and are useful for assessing progression or mapping enjoyment over time.

Relevant contextual data about build number, test name, participant ID, time stamp, difficulty setting, chapter/mission/quest/level/map name, position coordinates is also collected. On-screen activity with a time stamp is furthermore captured on video. Even though the TRUE method maps self-reported enjoyment over time via in-game surveys, and users are able to state in on-demand surveys whether or not they feel bored, there is also no mention of evaluating continuation desire or similar concepts with this method.

In the literature review it has thus not been possible to find a method to evaluate continuation desire, and it seems that no studies are concerned with evaluating this aspect of engagement during runtime. Consequently, this project will also focus on addressing the following problem:

**How can the continuation desire aspect of player engagement be evaluated?**

The motivation and background sections have identified several problems which need to be addressed in order for this project to succeed. The following sections will now describe the objectives of the project in more detail, identify the research questions and present the methodologies that will be used to address these issues.

# 3 Objectives

Based on the problems identified in the background section, the overall aim of this research project is to explore the concept of player engagement in digital games and to utilise continuation desire as a driver, in order to sustain engagement in interactive storytelling applications, learning scenarios and teaching.

Consequently, three objectives need to be reached in order to achieve the main goal.

The first objective is to develop a process-oriented framework of player engagement. This conceptual and theoretical framework is conceived with the primary intention of being used as inspiration for a design strategy aimed at aiding the development of novel hybrid forms of content for engaging interactive narrative experiences. This content can then be used in a variety of applications while utilising the converging area of games, films and stories, as well as digital game and media technologies. Moreover, the framework is also intended to categorise the desire to continue in interactive experiences, as well as to be used as an analytical tool for studying user experiences.

The second objective is to use the framework as a foundation for describing an evaluation method which aims at systematising the evaluation of engagement as continuation desire before the start of, during and after an interactive experience.

Finally, as the framework and the evaluation method lay out the foundations for a range of applications, the third objective is to illustrate their more practical uses.

In summary, the three main objectives of this project are to explore how the concept of engagement in interactive media can be described, evaluated and applied. These objectives lead to a series of research questions, which will be presented in the next section.



# 4

## Problems and Research Questions

Based on the objectives of the project, the investigation will aim at addressing the main problem through this primary question:

*How can knowledge about player engagement in digital games be utilised as a driver in alternative forms of interactive experiences such as emergent narratives and experiential learning scenarios, as well as in teaching?*

Answering this question not only contributes with knowledge about what it is that engages players, but also it opens up the possibility of harnessing the engaging power of digital games for other purposes. With this project I focus on applying knowledge about engagement in the design of interactive emergent narratives, experiential learning scenarios and as a motivational factor in teaching.

In order to address the main problem it is first necessary to investigate what it is that causes engagement when a user has an interactive experience. Then these findings can be used to describe how engagement can be systematised through the development of a conceptual and theoretical framework of player engagement.

Secondly, in order to be able to investigate if engagement is sustained during an experience, it is important to look into how it can be evaluated.

Finally, the findings are used to explore how the devised framework and the evaluation method can be used to develop engaging experiences in interactive media. In the case of this project, several applications of the framework and the evaluation method are introduced to demonstrate the concept.

The main problem therefore leads to a further focus on addressing three particular sub-problems concerned with these questions:

1. How to describe engagement?
2. How to evaluate engagement?
3. How to apply the acquired knowledge?

In the following, these sub-problems and the related research questions are described in more detail.

### 4.1 How to describe Engagement?

In order to gain an overview of the concept of engagement it is necessary to investigate how both users and the research community define and describe it in digital games by addressing these questions:

*What constitutes the concept of 'engagement' in relation to interactive digital media?*  
*What is an 'engaging experience' in digital games?*

Based on this foundation the next step is to identify how games engage players by investigating what in digital games drives players, and what causes or triggers engagement, by focusing on this question:

*What are the causes and triggers of player engagement in digital games?*

These causes of engagement can then be categorised and organised into components of engagement. This knowledge can then be used to develop a process-oriented framework of player engagement in digital games, which finally can be used to describe player engagement in detail. The exploration of engagement can thus be summed up through these questions, which are addressed in Paper I:

*What are the triggers, causes, categories and components of player engagement?*

*How can a process-oriented framework of player engagement be described?*

## 4.2 How to evaluate Engagement?

In order to address the problem of evaluating engagement in a user experience, Paper I presents a ranking method, while Paper II addresses how the framework of player engagement can be used as a foundation for evaluating engagement in interactive media, by investigating the following question:

*How can the player engagement framework be used to evaluate engagement in interactive experiences?*

## 4.3 How to apply the acquired knowledge?

Four cases are introduced in order to illustrate how the resulting framework, the process of player engagement and related categories and components can be applied to the design of engaging experiences and other purposes.

### **Case 1:** Designing for engagement in interactive emergent narratives

Papers III, IV and V describe how to organise events in a concrete interactive emergent narrative – the First Person Victim (FPV). The intention is that the interaction of the user has to be free, the experience should be dramatic and the engagement must be maintained. Therefore, these questions need to be addressed:

*How can player engagement be used as a driver in interactive emergent narratives, and how can engagement in such experiences be sustained?*

The reason for addressing these questions is that it is essential to investigate how the causes of continuation desire can be used to sustain users' engagement in interactive narrative experiences. As mentioned, these experiences may not need to be linear or causally related and driven by the conventional dramatic structures known from, for example, the 'Hollywood model' in films (e.g. Field, 1982). Therefore, this question addresses the problems of developing an alternative approach to the conventional cause and effect drivers of interactive stories while maintaining user engagement.

**Case 2: Evaluating engagement in an emergent narrative**

Papers II, III, IV and V all include various evaluations of engagement in the FPV. In Paper II the application of the runtime evaluation method is exemplified through a detailed case study. Papers III, IV and V moreover use an overall evaluation of engagement in the FPV. All these papers address this question:

*How can knowledge about engagement and the engagement evaluation method be used to evaluate an application?*

**Case 3: Engagement and Interactive Learning Scenarios**

Paper V is concerned with how to utilise the player engagement framework for learning scenarios, and it also investigates post-experience evaluations of engagement, learning outcomes and the potential for using the FPV as a tool for teaching. Paper V thus focuses on the following questions:

*How can experiential learning scenarios be developed and evaluated by using player engagement as a design and evaluation framework?*

*Can such scenarios be used as a tool for teaching?*

**Case 4: Engagement and teaching**

Finally, Papers VI and VII describe, by investigating this final question, how students studying Medialogy may become engaged through game development and innovative projects:

*How can student motivation be supported and explained by utilising knowledge about player engagement?*

## 4.4 Summary

The intention of this project is that an investigation of the research questions will lead to answers to the three sub-problems. These answers will eventually make it possible to reach the three objectives and thereby lead to a solution of the overall problem, namely how to exploit player engagement as a motivational driver in interactive narrative experiences and in other fields. Based on the sub-problems, the project will consequently focus on three themes, which will be addressed in three parts of the contribution chapter focusing on how to describe, evaluate and apply engagement.

In the following section, the methods used to address the research questions are presented.

# 5

## Methods

In order to address the main problem of this project, various methods are required to explore the sub-problems and related research questions. My approach is quite pragmatic, as I worked closely with students and staff at the Media Technology section at Aalborg University. A substantial part of my time during this project was used for lecturing a variety of courses and supervising different Bachelor and Master projects in Medialogy. I thus use this opportunity and the close contact with my students as a foundation for some of the more practical parts of the project. For example, I motivated students to work with applying engagement in different projects and let them evaluate a variety of my ideas in more detail.

This section is divided into three parts that are concerned with describing, evaluating and applying engagement. In each of the parts, I give an overview of the overall approach and which methods I have used to address the related research questions.

### 5.1 Exploring and Describing Engagement

The first sub-problem and its related research questions are concerned with investigating the concept of engagement. The research was thus initiated by addressing the questions related to describing engagement in interactive media, with a particular focus on player engagement and continuation desire in digital games.

Although there several studies on related concepts such as immersion, flow, presence, and enjoyment have been conducted, it seems that there have been limited empirical investigations into the continuation desire aspect of engagement in interactive experiences. Consequently, and to the best of my knowledge, there exists no theoretical framework concerned with this facet of engagement, so in order to gain a deeper understanding of the many aspects of this concept, an exploratory research approach (Stebbins, 2001) is chosen to address the main question.

According to Stebbins, exploratory research can specifically be applied when there is “little or no scientific knowledge about the group, process, activity or situation” (Ibid., p. 6). Furthermore, the method can also be employed when the field of study has “received little or no systematic empirical scrutiny, has been largely examined using prediction and control rather than flexibility and open-mindedness, or has grown to maturity [over time] but has changed so much on along the way that it begs to be explored anew” (Ibid., p. 9). Choosing the exploratory research approach as a main method is thus supported by the apparently limited empirical investigations of player engagement, with a focus on continuation desire, within academic gaming literature as mentioned earlier in the background section. Furthermore, the development and use of digital games and their interfaces are in a state of constant progression, so it makes sense to use this approach to generate new insights into and ideas about the field.

Exploratory research is described by Stebbins as “a broad-ranging, purposive, systematic, prearranged undertaking designed to maximize the discovery of generalizations leading to description and understanding of an area [...]” (Ibid., p. 3).

Moreover, exploration aims at acquiring essential information about a given subject

such that it can lead to the generalisation of a detailed understanding of the group, activity, process or situation studied. According to Stebbins, exploratory research also emphasises the development of theory from data, while qualitative research is concerned with the methodology and the actual collection of data (Ibid., p. 5).

Referring to Glaser and Straus (1967), Stebbins states that “exploration aims to generate new ideas and weave them together to form grounded theory, or theory that emerges directly from data” (Stebbins, 2001, p. 9). Confirmation of the grounded theory is then to be validated in a subsequent process. The generalisations of exploratory research therefore often continue after the first study has been completed (Ibid, p. 47).

The approach that ideas and theories emerge from the acquired data “differ[s] from confirmation and its reliance on *control* of variables and *prediction* of outcomes using hypotheses” (Ibid., p. 10). Consequently, this project does not aim at testing one or more hypotheses, but instead focuses on exploring the field empirically, in order to gather data and develop the conceptual and theoretical framework which can be used to evaluate and design interactive experiences.

In particular, the conceptual and theoretical framework is developed by using grounded theory inspired by the work on the related flow concept introduced by Csikszentmihalyi (1975), in which an exploratory research approach was also used (Stebbins, 2001).

The use of the exploratory approach is beneficial in my project because it lays out the foundations for understanding the field and uses the data for inquiries into both the grounded theory (interpretation) and theory testing (explanation) approaches, while being able to switch between induction (bottom-up) and deduction (top-down), in order to allow the data to develop into the final framework.

In particular, I use Stebbins’ concept of *exploration for discovery*, where the research aims at using different approaches and datasets while continuing until every important element for describing and understanding the studied field has been uncovered (Ibid, p.3).

In order to validate and challenge the framework, I furthermore use Stebbins’ method of *concatenated* explorative research: “The expression *concatenated exploration* refers at once to a research process and the resulting set of field studies that are linked together, as it were, a chain leading, to cumulative grounded or inductively generated theory” (Ibid., p. 12).

With this method different data sources are used in order to avoid bias and to validate the framework. Therefore, I used surveys, interviews, focus groups and observations as approaches to acquire data. According to Stebbins, one of the advantages of concatenated exploration is that the accumulated findings increase the level of validity and expand the range of applications of the findings. Even though primary studies are most often qualitative and secondary studies quantitative, a mix of both qualitative and quantitative approaches might also be used in exploratory research.

The methods used in the three phases of exploring the concept of engagement – data collection, theory building and validation – are described in the following sub-sections. This part of the project is furthermore addressed mainly in Paper I and in Chapter II, Section 2.

### 5.1.1 Initial data collection

In order to pursue the concatenated explorative research approach, triangulate the findings and develop more angles on the study, the data collection consists of various information and data sources originating from a series of different studies:

a) Related concepts: Engagement in the literature

Method: Literature review (initial)

In a first attempt to investigate the concept of engagement, a preliminary literature review was conducted. Although the literature did not focus directly on the continuation desire aspect of engagement, the review led to a tentative general description of the concept of engagement, which was then used as a foundation for the first exploratory case study concerned with university students.

b) Case study: Player engagement among Medialogy students I, Spring 2010.

Method: Qualitative questionnaires (online survey).

In order to identify which types of engagement exist (for example, when players keep playing to *achieve* the highest score, or when they keep *exploring* a location to find a key to the next room) a questionnaire was prepared and presented as an online survey to respondents. The survey was based on the tentative description of the characteristics of engagement and was intended to discover the causes and triggers of engagement when playing digital games.

Due to the vast amount of different games and player types, and the abundance of potential data, the online survey was conducted primarily with very general open questions, which were mainly concerned with identifying the reasons for wanting to keep playing (or not wanting to continue). However, questions related to motivations to begin playing, the causes for wanting to play again and the emotions related to the situation where a player wants to keep playing were also included.

According to the exploratory nature of the study the qualitative data acquisition method was chosen. The investigation was thus initiated by designing the survey to consist of a set of open-ended questions that would generate answers that could be used to develop the theoretical framework. If I had used closed-ended questions based on theoretical findings, the results would not have opened up for new findings in the field, as a result of the predefined range of engagement trigger categories.

In order to discover as many sources of engagement as possible, respondents interested and experienced in both gaming and game design were approached. Convenience sampling was used, as I recruited respondents from the course 'Integrated Systems Design' (including game design & theory), which I have been teaching in the sixth semester at Medialogy. Respondents came from the Aalborg University campuses in Copenhagen and Aalborg, and the sample gave access to a group of respondents who were interested in games on different levels (n=41). Concerning the sample size, a cohort of 30, in most cases, is sufficient, because this size "allows for the emergence of important categories and subcategories that will inevitably occur during the study", according to Stebbins (2001, p. 27).

### 5.1.2 Theoretical framework development

To determine how games engage their players based on the identified sources and triggers of engagement, the classic grounded theory methodology (originally Glaser & Strauss, 1967) was used as an inspiration. In particular, I chose the approach described by Charmaz (2006) to prepare and organise the data and to build the framework based on coding of the data gathered in the case study outlined above. This analysis of the data led to the development of a process-oriented conceptual and theoretical framework, as well as a model of the components of the framework. The illustration of the framework as a model was inspired by Dahler-Larsen's work on how to display results from qualitative data (Dahler-Larsen, 2008).

A detailed description of the approach is described in the Contributions chapter, section 2 and Paper I.

### 5.1.3 Validation and theory testing

According to Stebbins, “[v]alidity in exploration centers on the need to gain an accurate or true impression of the phenomenon under study” (p. 25). In exploration, validity can thus, for example, be resolved by triangulation and the use of a variety of methods to examine the same group or activity. The developed theories can also be further validated by addressing the issue of the observer's possible bias due to preconceived interpretations and selective perceptions by asking the informants to give feedback on the findings and “to comment on the familiarity and reasonableness of observations, and finding recurrent evidence for each generalization” (Ibid., p. 26).

In order to reach an analytical generalisation of the framework and to be able to challenge the validity of the findings, the concatenated exploratory research approach was used. The framework can therefore be challenged by critical evaluation effected through triangulation, with additional data acquired in four additional cases (see a, b and c below) and discussions with informants (d), focus groups and interviews (e) and finally subsequent in-depth literature reviews for comparison (f):

- a) Case study: Player engagement among gamers in online forums  
Method: Qualitative questionnaires (online survey).  
In order to explore if there were any types other than the initial identified categories of engagement among students, a few of the most active online forums focused on general game discussions – gamespot.com; neoseeker.com; gamesforum.com and gamerdna.com – were selected to recruit respondents (n=48). These forums covered various game genres and different player types. The approach and method were the same as in the primary data collection process, and to speed up the organisation of the results gathered, I used focused coding to investigate if any new causes of engagement could be identified.
- b) Two additional case studies: Player engagement among Medialogy students II + III. Spring 2011+12.  
Method: Qualitative questionnaires (online survey).  
In these case studies, I used the same approach and questionnaire as in the primary data collection and online forums. Two other groups of Medialogy students were surveyed in this dataset (n=42 and n=60). Again, focused coding was used to challenge the robustness of the framework.

- c) Case study: Player engagement among pupils at three public lower-secondary schools.  
Method: Qualitative questionnaires (in-class survey conducted online).  
In order to address yet another target group, I also collected data from among pupils in three public lower-secondary schools (n=40), by using the same procedure as in the primary data collection process. Focused coding was used once more to try to discover other categories of engagement.
- d) Verification of observations and framework among Medialogy students.  
Method: In-class discussions and semi-structured interviews.  
Since the analysis of the answers to the open-ended questions might have been biased or misunderstood by me, I discussed the observations and the resulting categories of causes, as well as the framework, with three different classes of students, who followed the courses where I conducted the surveys.
- e) Verification of the conceptual and theoretical framework among game scholars and designers.  
Methods: Focus group interviews and two semi-structured interviews.  
The framework was also discussed with game scholars and designers in order to verify the elements and relationships of the framework in more detail.
- f) Comparing the framework with related concepts  
Methodology: Literature Review.  
Finally, archival/document analysis through an in-depth literature review was used to compare the theoretical framework with what others have described.

The various collections of data, the exploration of engagement, the development of the framework in Paper I and the validation of the conceptual and theoretical framework will be described in more detail in Section 2 in the Contributions chapter.

## 5.2 Evaluating Player Engagement

After validating the framework, I used the findings in both Papers I and II as foundations for developing two methods intended to evaluate player engagement in interactive experiences.

With the first approach, the qualitative data acquired in the data collection in the three first case studies was analysed through focused coding and counted in Paper I. These cases were concerned with students (n=41+42) and online game communities (n=48). The intention was to use the resulting quantitative information for ranking the preferences of the engagement categories among all respondents (n=131), in order to exemplify the use of the framework.

Furthermore, Paper II introduces another approach, namely the intrusive method and the 'Engagement Sampling Questionnaire,' which was intended to evaluate engagement during an experience. The research approach used to develop this method was based on archival/document analysis through a literature review, with a focus on in-game and runtime evaluations. The intrusive method was also inspired by Csíkszentmihályi's work on the experience sampling method (Csíkszentmihályi, 1997).

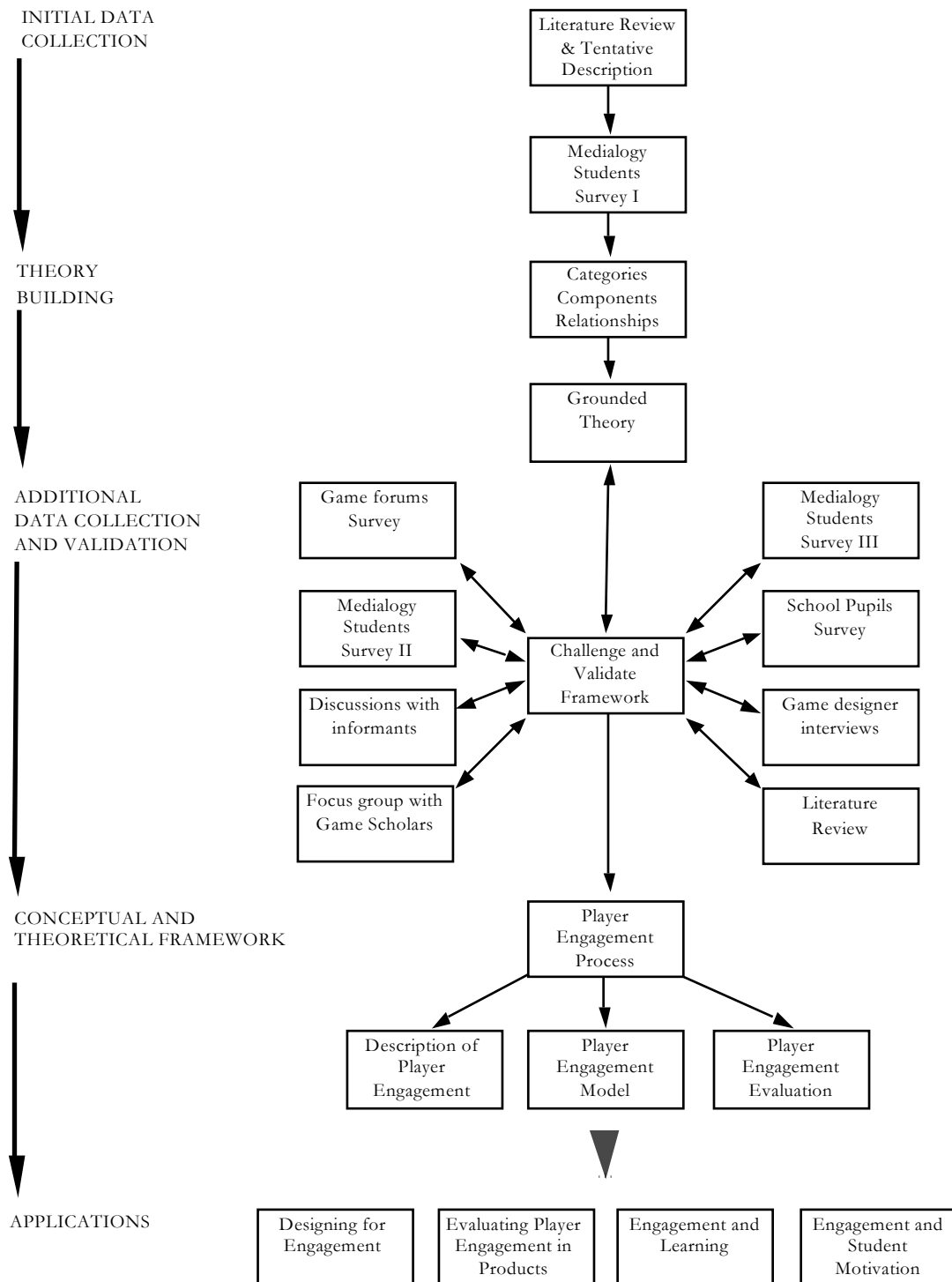


## 5.3 Applying Engagement

The resulting conceptual and theoretical framework and the evaluation method are intended to be utilised for future research and a variety of applications. In order to exemplify how these findings can be applied, the following four cases are included in the project:

- a) Applying player engagement in interactive emergent narratives  
This case, which is addressed in Papers III, IV and V, presents an alternative approach to the problems of interactive storytelling exemplified with an interactive dramatic experience. In this application users try to play the role as a victim of war in an interactive 3D war scenario – The First Person Victim (FPV). The FPV application was furthermore designed in close cooperation with students and colleagues at Medialogy.  
This application aims to create engaging narrative experiences, which are not experienced as ‘concealed’ linear structures, but ‘real’ interactive and open non-linear experiences. Therefore, the intention is to cover new grounds in the field, and accordingly it is essential that this part of the project also uses the exploratory research method.
- b) Evaluating engagement in the First Person Victim application  
Papers II, III, IV and V all include examples on how to evaluate engagement in the FPV application. Here, the methodological approach is based on the quantitative and qualitative evaluation method introduced in Paper II, and the results are used to investigate users’ experiences based on the engagement categories described in Paper I.
- c) Player engagement as a driver in an interactive learning scenario  
In this case, the findings about player engagement are used in Paper V to describe how this knowledge can be employed to design for engagement in a learning scenario. The evaluation method from Paper II is combined with observations of players, post experience in-class discussions and quantitative and qualitative questionnaires. The results are utilised to map the experience based on the engagement categories and explore learning outcomes, as well as to investigate the potential of using the FPV as a tool in teaching.
- d) Engagement, game design and innovation as a driver in teaching  
The last case, which is described in Papers VI and VII, focuses on my experiences teaching and supervising student groups and how the findings about player engagement can be related to student motivation based on my own observations.

The exploratory research approach used in this project is illustrated in Figure 1, which also shows how the data gathering, theory building and different steps in the process are related.



**Figure 1.** Overview of the approach.

## 5.4 Summary of Methods

Since this project is concerned primarily with investigating a field where there seems to be very limited empirical investigations, the main methodology used is exploratory research and theory building based on qualitative data gathering. This approach, which I chose as my primary method, proved to be beneficial in developing a conceptual and theoretical framework in line with the continuation desire aspect of engagement. The method also helped me to develop a player engagement evaluation method and supported the experiments where the findings were used for a variety of applications, including using player engagement as a driver in interactive emergent narratives.

In the following chapter, these contributions and the related papers are presented. Furthermore, the application of the research methodology will be explained in more detail while addressing the limitations and possibilities of the approach.

# II Contributions

The contributions of this project are founded on an understanding of engagement as the desire to continue an interactive experience, where a user needs to be motivated to begin the experience, followed by a desire to continue and finally a willingness to come back and try the experience again.

This approach has led to an empirical investigation of player engagement and an identification of the causes, categories and components of engagement, resulting in a process-oriented player engagement framework.

The framework was then used as a foundation for developing a novel intrusive method and an accompanying questionnaire designed to evaluate and measure levels of engagement as continuation desire in interactive experiences.

Furthermore, the player engagement framework was used in the design of an emergent interactive story prototype, which is intended to be used to inform and teach about serious topics concerned with being a victim of war.

Finally, the framework may also be used to explain the motivation of students when they are being challenged through problem-based learning, innovation and the development of games.

The next section will give a short overview of the contributions and relationships of the papers. In the subsequent sections, contributions and answers to the research questions will be described in relation to the three main problem areas: exploring and describing player engagement (Section 2), evaluating engagement (Section 3) and the application of the framework and evaluation methods (Sections 4-7). Moreover, the contributions, reflections and discussions related to each paper will be presented, where appropriate.

# 1 Relations of the Papers

In order to present an overview of the papers, this section will sum up the purpose and contribution of each one in turn.

The first paper – Paper I – is concerned with exploring the concept of engagement in interactive media by focusing on empirical investigations of the ‘continuation desire’ aspect of engagement in digital games. Based on the empirical findings (n=41), Paper I also presents a conceptual and theoretical framework consisting of the categories, components and processes involved in player engagement. Furthermore, an evaluation method for identifying a general ranking of the categories among university students and online game forums (n=131) is presented.

Paper II utilises the framework and proposes a method intended to evaluate engagement during runtime in interactive storytelling applications and digital games. This paper also uses the method to evaluate a concrete application, namely the interactive ‘First Person Victim’ (FPV) experience, among university students and staff members (n=22).

The third paper – Paper III – presents an overview of the actual development of the structure of the emergent narrative in the FPV application, which is based on the acquired knowledge about engagement in interactive media from Paper I and an ‘Interactive Dramatic Experience Model’.

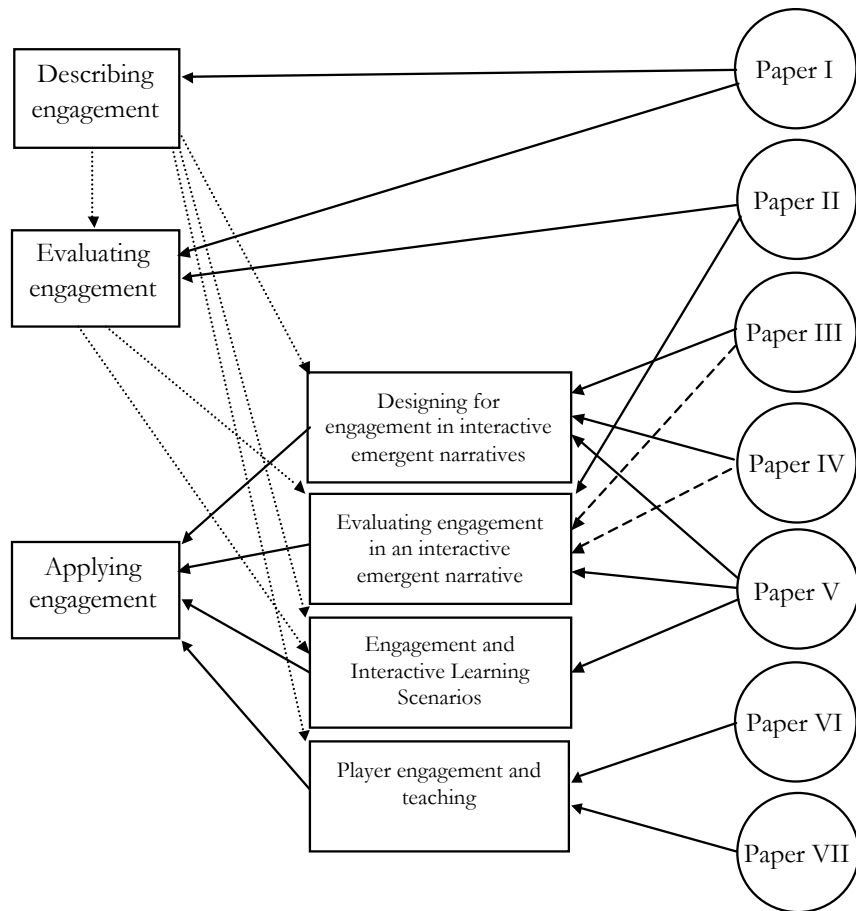
Paper IV describes this model and the contextual background of the FPV application in more detail. Paper IV also describes how the framework from Paper I was used to drive participants through the experience by attempting to design for sustained engagement.

In Paper V, the focus is on how the framework was applied to design the FPV experience as a learning scenario, and how it was used as a case study among pupils (n=40). In this study the FPV was evaluated in three different Danish public schools by using the evaluation method introduced in Paper II.

Papers VI and VII are concerned with another aspect of how knowledge about player engagement can be applied in the area of teaching, by focusing on how students at Medialogy may become engaged through problem-based learning, game development and innovation.

Figure 2 depicts how the papers contribute to the investigation of the three main problems (lines right to left) and how the findings are applied (dotted lines). The dashed lines represent the limited inputs from Papers III and IV used in the evaluation of the FPV. The figure thus sums up the research approach by illustrating the elements of the process and shows how the contributions from different papers answer the research questions related to the three main areas of investigation:

- a) The exploration and description of engagement (Paper I)
- b) Evaluation methods (Papers I and II)
- c) The applications of the findings (Papers II to VII)



**Figure 2.** Relations between main problems/themes, sub-problems and papers.

# 2

## Exploring the Concept of Player Engagement

The objective of the first part of the project is to explore and describe engagement, and thereby form a theoretical and practically founded framework intended for use in a variety of applications.

As mentioned in the introduction, it seems like there is relatively sparse systematic empirical research into the determinants that cause engagement (and disengagement) and how users rank them accordingly. Consequently, it makes sense to explore empirically what it is that triggers media engagement and makes users, players and audiences want to continue their experiences. In other words, what is it that media consumers *do* while they have the desire to continue, and which emotions, affect and experiences are triggered by this willingness to continue the experience?

Paper I describes this exploration by focusing specifically on what it is that constitutes the concept of engagement in relation to interactive digital media and how to describe an ‘engaging experience’ in digital games. The paper therefore investigates the continuation desire aspect of player engagement and describes the development of a player engagement process framework through an empirical identification of the causes of engagement.

This section will describe the contributions from Paper I in more detail by following the approach described earlier in the methods section and illustrated in Figure 1 in the methods section in the introduction chapter.

In Paper I, the exploratory research approach was applied and initiated through the design of an online survey that was intended to capture the causes which trigger the desire to continue an experience and the incentive to keep playing. The questionnaire in this survey consisted of a set of open-ended questions which would generate answers that later could be used as a foundation for the development of the framework. The questions were founded on an initial literature review and the resulting tentative characteristics of player engagement described in Paper I.

The questionnaire consisted of the following three basic questions: “What in a game makes you want to continue playing?”, “What in a game motivates you to play?” and “What in a game makes you want to come back to play?” In order to also identify triggers of emotional releases, the question “What in a game gives you satisfaction?” was added. Furthermore, the question “What in a game does not make you want to continue playing?” was included, in order to discover the triggers of disengagement. Demographic data about the respondents was also gathered and is described in further detail in Paper I.

I decided to approach respondents who were interested and experienced in both gaming and game design, in order to discover as many causes and triggers of engagement as possible. The study involved sixth-semester students from the Sections of Medialogy at both Copenhagen and Aalborg campuses. The group from Copenhagen (n=19) participated in a course in game theory and development two weeks prior to answering the questionnaire, whereas the group from Aalborg (n=22) had to fill out the questionnaire prior to the game theory and design course. Although the respondents were recruited through convenience sampling, the sample was intended to be a mix of students with varying levels of knowledge about games, which would make it possible to identify a large variety of triggers and causes of engagement. Respondents were instructed to answer the survey online via email. In total, eight females (20%) and 33

males (80%) responded (n=41). The average age of the respondents was 23.5 years (range: 21-41 years).

The gathered data from the five open-ended questions resulted in 205 answers which were analysed, categorised and organised by using the grounded theory approach (Charmaz, 2006; Boeije, 2009). First, the data was segmented through open coding, which resulted in 95 initial code categories, each describing triggers related to the desire to continue playing. In order to reduce the dataset and identify both the main and sub-categories, the initial categories were analysed through axial/focused coding (Charmaz, 2006). This process further reduced the data set to 33 sub-categories and 18 main categories. Finally, selective coding was used to identify four core categories, as well as connections and relationships between these core groups. Using this approach, it was possible to develop a process-oriented conceptual and theoretical framework, which describes the components and the related main categories<sup>1</sup> of the causes and triggers of player engagement and disengagement.

The main contribution of Paper I is consequently that player engagement may be described as a subjective process which changes over time. When being engaged players initially and repeatedly engage in a pursuit of two different kinds of **objectives**.

*Intrinsic objectives* are objectives defined by the players themselves, while *extrinsic objectives* are objectives set up by the game. Objectives are thus the fundamental triggers of player engagement, and players might be motivated by these intentions to keep playing by reaching goals and pursuing rewards.

In order to reach the objectives, players consequently perform a range of **activities**. The analysis of answers from the respondents suggests that the following ten activities are major causes for wanting to continue playing:

- *Interfacing* with the game through the body (e.g. utilising the possibilities of Microsoft Kinect, Nintendo Wii and PlayStation Move systems).
- *Sensing* audio-visuals and other kinds of feedback from the game.
- *Solving* problems (e.g. devising strategies, resolving puzzles).
- *Exploring* the game world, environment and game mechanics.
- *Experimenting* with the possibilities of the game.
- *Experiencing the story* development.
- *Experiencing the characters* (e.g. through character development and customisation).
- *Creating* something.
- *Destroying* something or eliminating other entities in the game.
- *Socialising* with others while playing (e.g. through competition, collaboration, camaraderie and communication).

Players may also perform these activities to **accomplish** objectives. Respondents stated that they want to continue playing in order to experience one of three types of accomplishments: *achievement*, *progression* and/or *completion*.

While players perform activities or when they accomplish something, they might experience three different kinds of **affect**, which may be *positive*, *negative* or may have *absorbing* qualities. In this study, affect is interpreted as being related to emotions, following Brett and colleagues' description of the affective domain as encompassing the "physiological, cognitive, and behavioural processes related to emotion." (Brett et al., 2003, p. 1). Affect can furthermore be explained as the trigger of emotions experienced

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<sup>1</sup> In the following paragraphs these categories will be emphasised with *italics* and the components in **bold**.



by a player while playing, by applying Norman's (2004) definition of affect as the subjective conscious or subconscious judgemental system which may influence an individual's emotions. According to Norman, emotions are the conscious experience of affect, "[...] complete with attribution of its cause and identification of its object." (Ibid., p. 11).

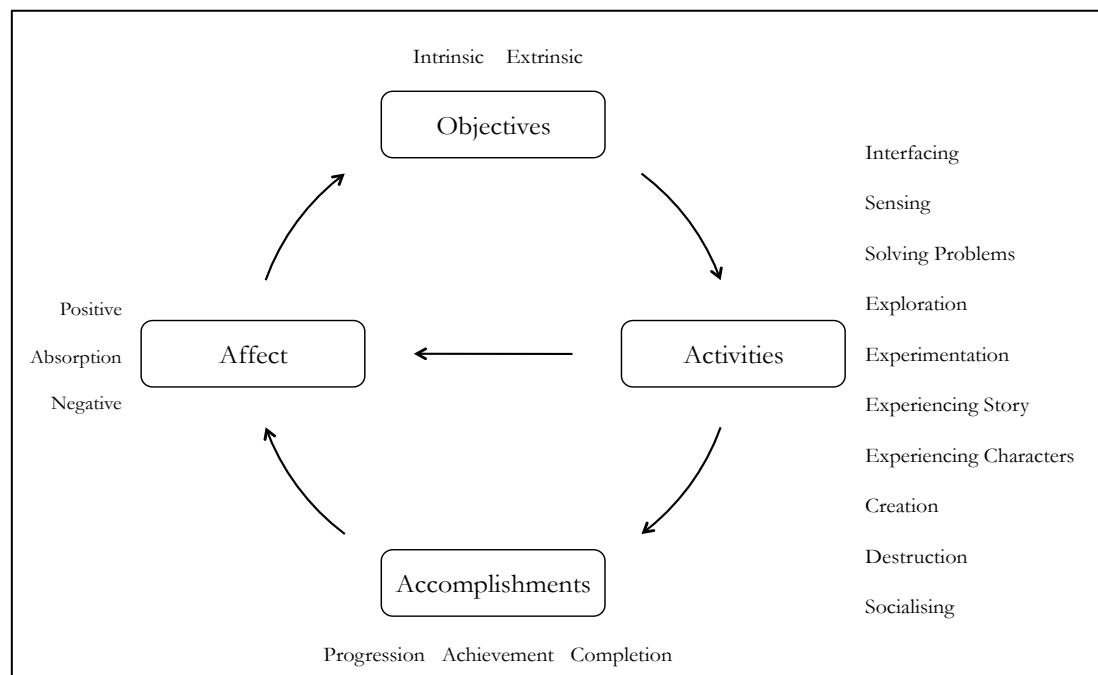
For that reason, it should be possible to let players describe their experience of affect during gameplay; not only as conscious emotions with concrete, identifiable causes but also as subconscious feelings that manifest themselves without identifiable causes.

In addition, the term affect may therefore also encompass some of the emotions that researchers traditionally have associated with engagement, such as fun, enjoyment, pleasure, immersion, involvement, flow and presence.

If the player experiences the affect as positive, the process may continue through the establishment of new intrinsic or extrinsic objectives. However, if the affect is experienced as negative, disengagement might occur.

Furthermore, the experience of continuation desire is subjective and a player can experience more causes of player engagement simultaneously. For example, a player might want to continue playing in order to feel relaxed, while at the same time wanting to complete a puzzle.

The Player Engagement Process (PEP) framework, the related 18 main categories of triggers of continuation desire and the related causes of disengagement are described in more detail in Paper I. The process can furthermore be illustrated through the Objectives, Activity, Accomplishment and Affect (OA3) model depicted in Figure 3.



**Figure 3.** The Player Engagement Process: Objectives initiate Activities that might result in Accomplishments and/or Affect, which may then lead to new objectives. (The OA3 model, Paper I)

The OA3 model illustrates the relationships between the components of continuation desire. In summary, player engagement can accordingly be described as the perseverance and desire to continue performing an activity, in order to accomplish an objective while experiencing some kind of affect.

## 2.1 Discussion and Reflections

Studying the concept of player engagement by focusing on the aspect of continuation desire has been beneficial, and the findings suggest that a number of determinants need to be examined when attempting to understand it fully. The use of exploratory research and grounded theory methods also proved to be valuable in addressing the research questions, as they made it possible to investigate empirically the many facets of engagement, which then resulted in new knowledge and a more detailed understanding of continuation desire.

As I worked through the initial data collection, which was acquired through a questionnaire based on the initial literature review, I also found relevant literature concerned with related concepts of engagement. Nevertheless, I did not read about any potential categories and triggers of player engagement in detail until I had the final framework ready for validation. This ‘no pre-research literature review’ approach was used as inspiration in order not to bias my theory building according to the classic grounded theory method. By choosing this approach, I obviously faced the risk that other researchers might have found similar triggers, relationships and explanations of engagement. However, at the closing stages of the project, I was still not able to find anyone focusing on the continuation desire aspect of engagement while using empirical investigations and case-studies to devise a process-oriented model of player engagement.

In order to challenge the framework further with new datasets, and to verify that no new triggers and categories of continuation desire could be identified, another class of media technology students ( $n=42$ ) and online forum users ( $n=48$ ) was surveyed in 2011 with the same questions as in the first dataset. The focused coding found that no new causes of continuation desire were found in these two datasets.

In addition to these two datasets, which are also described in Paper I, further attempts to reach theoretical saturation in order to validate the framework were conducted. When any new trigger of continuation desire found in other datasets can fit into the already identified categories of triggers, components and concepts, as well as in the relationships between the concepts, theoretical saturation can be accomplished. The following datasets have not yet been included in any publications, and are thus included here to additionally illustrate the validation of the framework:

While working on my project, I attended several PhD courses concerned with digital games, and during my presentations at these courses I asked more than 30 other PhD students and the lecturing senior researchers to note down what elements of a digital game made them want to continue to play. By using focused coding on the answers I was unable to identify any new triggers of engagement with this dataset. During the spring of 2011, I visited the Massachusetts Institute of Technology (MIT) in Boston, where, during one of my invited talks, I once again asked senior staff at the Gambit Gamelab to note down what made them want to continue playing a game. By using focused coding on these datasets, I was still unable to identify any new categories of player engagement.

This was also the conclusion after asking 40 teenagers in three public schools what made them continue playing ( $n=40$ , average age: 15, range 13-18, males: 35%, females: 65%). This dataset was acquired through a survey, which was conducted in connection with the evaluation of the First Person Victim in Paper V.

There were also no new categories or triggers found with a recent dataset from 2012 based on the same questionnaire with yet another class of media technology students ( $n=60$ , average age: 24, range 21-34, males: 83%, females: 17%).

However, additional examinations of other target groups (e.g. female, casual, hard-core or elderly players) and specific games might also validate further the categories found in the current study.

At MIT, I moreover presented my player engagement process framework, conducted a focus group interview with ten game research experts and held three in-depth interviews with experienced game designers and senior researchers, in order to challenge the framework. A semi-structured interview approach (Kvale and Brinkmann, 2009) was applied during these interviews in which the conversations were initiated with a pre-planned starting point and structured through different themes. The results from the interviews indicate that the framework developed in Paper I can be considered as quite comprehensive, due to the fact that the interviewees did not find any reason to question the relationships between the components, nor did they suggest that additional categories were introduced. Nevertheless, an investigation among more game designers into how they design games in order to make people keep playing could furthermore corroborate the findings in this project.

In addition to the literature reviewed in Papers I and II, the following descriptions of engagement in the academic literature seem to support my proposed categories of continuation desire and the PEP framework.

For example, industry veterans, Klug and Schell (2006) summarise the motivations for why people want to play games in general based on 30 years of game design experience. They present a range of player types, each of whom has a different need which is satisfied by their favourite type of game. As exemplified in the following, the desire to continue may be related to the categories from the PEP framework and explain what drives each of them through a game (the words in *italics* describe the related player engagement categories):

- Competitor (*socialising, destruction of opponents, accomplishments, affect: triumphant*)
- Explorer (*exploration*)
- Collector (*achievements*)
- Achiever (*progression, achievements*)
- Joker (*socialising, affect: amusement*)
- Director (*experimenting, experiencing story and characters, creation, affect: being in charge*)
- Storyteller (*experiencing the story and characters, sensing, creation*)
- Performer (*experiencing characters, interfacing, affect: recognition*)
- Craftsman (*creation, solving problems, experimenting*).

According to Klug and Schell, players might be motivated to play as a combination of more player types, and these types influence how players' needs are met and which games they are motivated to play (Ibid., pp. 92-97). The framework can also be related to these needs, since in general players play because they want:

- to control their environment (*interfacing, accomplishments*)
- to vicariously experience something they know of, but otherwise only as an observer (*experience the story and characters, sensing, experimenting*),
- to vicariously live elsewhere and 'elsewhen' (*experience the story and characters, experimenting, sensing, exploring, creating, solving problems, interfacing, affect: surprise*)
- to compete (*socialise, destroy, accomplish, affect: triumphant*)
- to explore fantasy relationships safely (*exploring, experimenting, experiencing characters and story*).

Although that study is not directly concerned with the desire to continue playing, all types of players and the reasons for playing can be explained through most of the categories in the PEP framework. This indicates that the 18 categories can also be used as a foundation for further understanding the overall reasons why people play.

The SCI (sensory, challenge-based and imaginative immersion) model of the experience of immersion (Ermi and Mäyrä, 2005) is based on an earlier study by the same authors (2003), which examined the pleasures 10-12-year-old children experienced when playing their favourite games (n=15). The factors revealed in the 2003 study are comparable to some of the categories of continuation desire suggested in my study and they all fit in to the player engagement process framework, which suggests that the PEP framework can be used to explore the continuation desire of younger target groups as well.

In the comprehensive literature review and exploratory study carried out in O'Brien and Toms' work (2008) user engagement is defined as "a quality of user experience characterized by attributes of challenge, positive affect, endurability, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control" (Ibid., p. 938). There are many similarities between these attributes and the identified components and categories in my study, as the PEP framework indirectly includes all of the listed attributes in their work and more besides (e.g. progression, socialising, experimentation, exploration and affect). Although this also confirms my findings, it should be noted that their investigation is more general. Engagement in their study is examined from "a quality of user experience" point of view, covering Web searching, online shopping, webcasting and gaming applications (Ibid., p 938). Conversely, my study focuses on digital games only and considers engagement as a proactive activity, where certain prerequisites are required for a player to engage. Due to the general nature of their work, O'Brien and Toms are thus not as detailed in the description of the sources of engagement, whereas the study in Paper I focuses directly on the specific causes and triggers of continuation desire. However, it could be valuable to investigate continuation desire in other types of interactive experiences in more depth in future explorations.

In yet another study, Calleja (2011) describes the unique involving aspects of players' experiences in virtual game environments. This study introduces a player model of involvement, which consists of two temporal phases and six dimensions of involvement. The micro-involvement phase addresses in-game involvement during play, while the macro-involvement is concerned with off-line involvement including pre- and post-game aspects. Although the concept of involvement is not similar to continuation desire, the temporal phases can be related to the PEP framework, where involvement can be described as a part of the affect component. In-game continuation desire may thus lead to the experience of involvement in the micro-phase during play. The PEP framework can also be used to explain motivations in the macro-phase involvement. In this phase, players might also set up objectives and perform activities (such as solving strategic problems), in order to accomplish something when not playing (e.g. being the best among their fellow players) and thereby experience off-line involvement as a pre- or post-game experienced affect.

Calleja furthermore identifies six dimensions of involvement: ludic, kinesthetic, spatial, narrative, shared and affective. These dimensions can be experienced by players through more or less attention directed towards that dimension of involvement. The six dimensions of involvement can likewise support some of the identified categories of player engagement in the PEP framework: *ludic* (which is related to objectives (goals), activities (actions) and accomplishments (rewards)), *kinesthetic* (related to interfacing), *spatial* (related to exploration and sensing), *narrative* (concerned with experiencing the story and characters), *shared* (related to social) and *affective* (comparable with affect).

Moreover, Calleja proposes the concept of incorporation as an alternative to the concept of immersion, in order to account more accurately for the various factors which constitute the sense of virtual environment habitation. Incorporation is described as an

intensification of internalised involvement, which can emerge when players experience a blend of a selection of the six different dimensions. Calleja originally defined incorporation in another study as follows: “Incorporation is the subjective experience of inhabiting a virtual environment facilitated by the potential to act meaningfully within it while being present to others” (Calleja, 2007, p. 257).

It can therefore be argued that continuation desire in some instances might be the prerequisite of incorporation and involvement, as both may be the affective result of activities and accomplishments in the player engagement process. However, the PEP framework and the OA3 model are different compared to the involvement model, as my contributions describe a process-oriented model of engagement, whereas the involvement model explains degrees of involvement, which may then lead to incorporation.

Additionally, the findings in my project can enhance further the descriptions of engagement and engrossment in the work by Browns and Cairns (2004). In order to be engaged or engrossed, a player first needs to be motivated to begin playing (by setting up an objective), and then time, effort, attention and emotion must be invested (by performing a range of activities and experiencing affect), in order to continue playing (by devising new objectives after experiencing accomplishment, as well as affect). However, even though their study was particularly helpful in the initial phases of my project, their work is concerned with immersion, which has different qualities than continuation desire, so a detailed investigation of the components and categories of player engagement was of no crucial concern in that investigation.

In conclusion, it seems like the process-oriented framework of player engagement is rather comprehensive and based on the literature review in Paper I and above and the theoretical saturation of the acquired datasets, which uses answers from over 250 respondents in total. However, it originally only builds on an exploration of the field spanning a short time and a limited number of non-representative respondents (n=41). Nevertheless, the framework is designed for flexibility and each component could potentially be expanded with add-ons, should the presence of novel categories of continuation desire triggers occur in other target groups or future games.

The findings from the exploration of player engagement will be used in the next section to propose methods for evaluating continuation desire in interactive media and games.

# 3

## Evaluating Engagement

This section addresses the research questions concerned with how to evaluate engagement in interactive experiences and how the player engagement framework can be used to solve this problem.

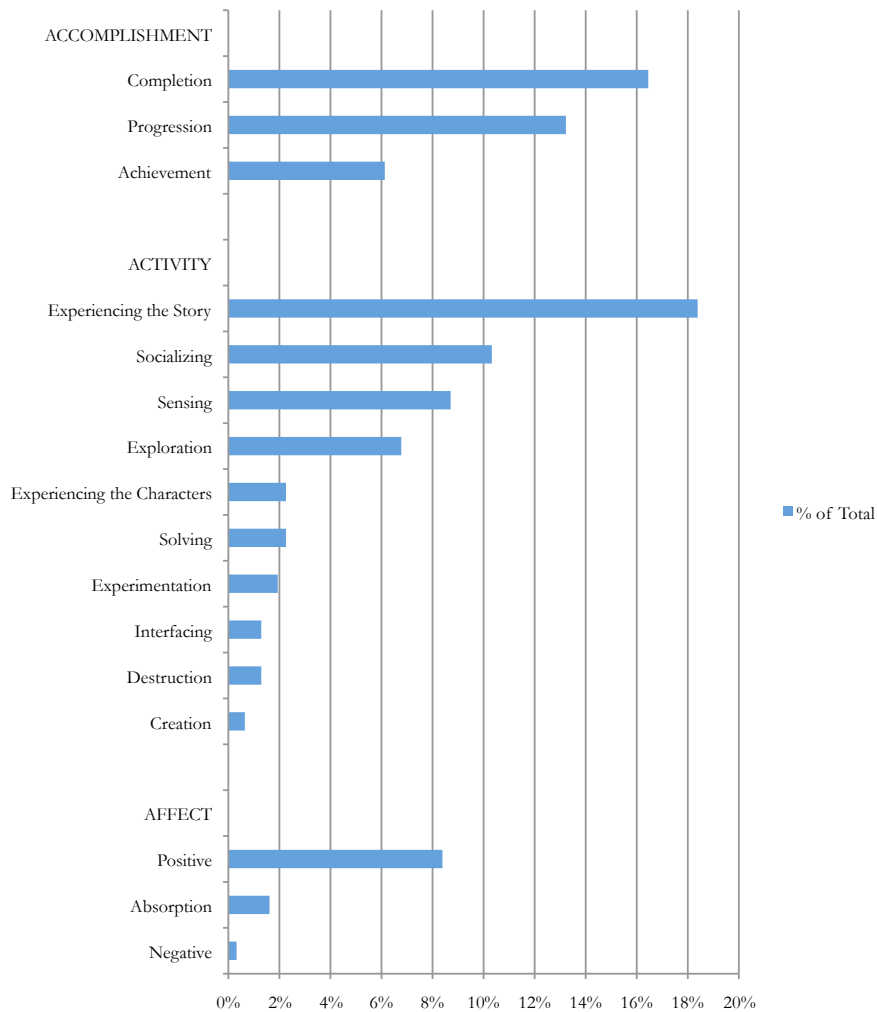
During the project, two main methods were developed. The first method was intended to rank the preferences of engagement through the use of qualitative data and to compare continuation desire within different kinds of interactive experiences, games, game genres, player types and groups of players. The second method introduces the intrusive approach and the Engagement Sample Questionnaire (ESQ) that can be used to evaluate the continuation desire aspect and level of engagement before, during and after an interactive experience.

### 3.1 Ranking Engagement

Paper I contributes with a Player Engagement Ranking Method (PERM), which ranks the engagement preferences of respondents based on the open-ended question “What in a game makes you want to continue playing?”. By analysing and organising the answers it is possible to relate each statement to the different categories of player engagement presented in Paper I. The statements related to each category are then counted and finally rank-ordered.

The PERM approach was applied with the data gathered in Paper I, in order to exemplify usage of the method, and was based on three surveys (students,  $n=41+42$ ; game forums,  $n=48$ ).

All the resulting statements ( $n=310$ ) were organised into categories, counted, organised in the components of activities, accomplishments and affect and finally rank-ordered. Figure 4 shows how frequently in percentage terms the respondents mentioned elements of the various categories.



**Figure 4.** Categories of player engagement rank-ordered; 131 respondents, 310 statements. “What in a game makes you want to continue playing?” (from Paper I)

The results illustrate that accomplishment in total (36%), experiencing the story (18%), socialising (10%), sensing (9%), exploration (7%) and positive affect (8%) were the most frequently mentioned reasons among this group of respondents for wanting to continue playing.

### 3.1.1 Discussions and Reflections

The ranking in Figure 4 obviously only indicates the significance of the categories among the respondents in this study. The respondents were selected through convenience sampling, and if the results were to be generalised, a sample representing the general population and a much larger cohort would be needed. The respondents’ answers are also based on their experiences of playing games in general, and the results clearly depend on each respondent’s favourite game genre and what they usually play. If a group of respondents, for example, favours games with a strong narrative element and interesting characters, this group would clearly mention the categories of experiencing the story and characters more frequently.

Nevertheless, the method could potentially be used to evaluate a single genre or game, if respondents were asked to play that game and then answer open-ended questions

about what made them want to continue playing. This approach would be beneficial in online surveys as a supplement to in-depth focus group interviews. A major drawback of the method is that it is obviously very time-consuming to analyse and categorise answers from the open-ended questions. Nevertheless, this process could be automated by the use of qualitative data analysis (QDA) software like NVivo (2012).

Another weakness of the method is quantification through the interpretation of answers which might have been biased by the researcher. This problem could be addressed by having different researchers analyse the answers and organise them according to the categories. Another, less time-consuming approach could be to use closed-ended questions in quantitative surveys by using the player engagement categories identified in Paper I. Respondents should then answer either questions with ordinal scales identifying a graded preference for each category of the causes of continuation desire, or questions with nominal scales marking the categories, which best would describe a certain experience of engagement. If the last approach should have been used to acquire the findings about the general experience of player engagement in all types of games presented in Figure 4, there would be a risk that many respondents would mark most options, as they most probably have experienced most causes and triggers while playing in general. Therefore, this method would be more suited to categorising player engagement in specific games or game genres.

For an exemplification of a comparison of the overall ranking with random respondents in my limited survey, it would be interesting to look at a specific investigation of a certain game genre with a specific target group. In a study by Williams, Yee and Caplan (2008), the three main general motivations to play massively multiplayer online roleplaying games (MMORPG) are ranked. The motivational factors (Achievements, Socialising and to be Immersed) were identified by Yee (2006) and are explained in more detail in Paper I. In that study, 7,000 MMORPG players were surveyed, and the results show that the motivational factor of achievement ranks the highest, next is the social item and finally immersion. These findings and my rankings are not absolutely comparable, as I rank the desire to continue playing, while Williams et al. investigate the overall motivations to play. Moreover, the factor of competition is included in the achievement category in their study, whereas it is part of my socialising category. Nonetheless, there is a trend in both investigations whereby the achievement item (advancement, game mechanics, competition) and my accomplishment category (progression, achievement, completion) rank the highest in both studies (36% in my study). Furthermore, the socialising category in the PEP framework has a lower ranking (only 10%) than the social factor (socialising, relationship, teamwork), which is the second highest ranked in the Williams et al. study. Finally, the immersion factor (exploring the world, role-play, customizing characters and escape from the real world) could be comparable with a combination of my categories of exploring, experiencing the story and characters, as well as absorption. These categories were in total mentioned in around 30% of all answers by the respondents in my study, which is a higher frequency than I found for socialising (10%). Although this comparison may only indicate differences (and my data is based on a low sample size), the trend shows that MMORPG players unsurprisingly rank social aspects higher than students and gamers from the online forums I surveyed. Positive affect, experimenting, solving problems, interfacing, destruction and creation were not included in the other study, and these categories account for the remaining 24% in my study.

However, it is imperative to state that this comparison is only included here as an example and that future investigations with larger representative samples and compatible categories are needed, in order to compare accurately a range of different target groups, player types, personalities and, for example, game genres or games.



## 3.2 The Intrusion Method and the Engagement Sampling Questionnaire

In order to address the problem of how to evaluate engagement further, a self-report method to evaluate engagement in interactive experiences was developed. This method specifically aimed at investigating the continuation desire aspect as engagement during runtime.

As already mentioned in the introduction chapter, there are a variety of tools and measurement methods which are concerned with investigating the player experience or engagement in games. However, a self-report evaluation of, for example, the concepts of fun, flow, immersion and presence all share the same challenge, in that the moment a player is asked if he or she is having fun, is immersed, in flow or experiencing presence, the experience might be broken, and capturing the impression of these experiences may then be difficult to acquire. It can thus be a problem when the experience is interrupted, since a fundamental characteristic of these concepts is that the user is focused, has their attention directed toward the experience and is losing any awareness of their surrounding environment. Many self-report questionnaires which investigate the above concepts have therefore been executed after the experience in a post-play setting, in order to avoid breaking the experience during gameplay.

This project uses in-game self-report questionnaires and takes an alternative approach by focusing on the evaluation of continuation desire as one dimension of engagement. I argue that players will have the desire to continue playing, even if they are interrupted while playing a game. Consequently, I suggest that the player's desire to continue can be separated from concepts such as immersion, presence and flow in the evaluation of interactive experiences.

Although disruptive questionnaires are a standard method of inquiry during gameplay in the industry today (e.g. Pagulayan et al., 2003; Davis et al., 2005; Kim et al., 2008), there seems to be a lack of runtime self-report investigations of the desire to continue the experience, which is a crucial prerequisite for achieving engagement in any interactive experience.

In order to investigate engagement in the context of playing digital games, it is thus obviously necessary to focus on capturing the degree to which a player wants to continue the experience. I will therefore introduce a method, which is intended to be used to evaluate and assess the continuation desire aspect of engagement, not only in digital games, but also in interactive narratives and in other interactive experiences. The method consists of an intrusive method of inquiry and a questionnaire which can be used in online surveys, in order to evaluate continuation desire as an aspect of engagement. More specifically, Paper II contributes with the Engagement Sample Questionnaire (ESQ) and the intrusive method, which are based on the Player Engagement Process introduced in Paper I. The intrusive method is also inspired by Csíkszentmihályi's work with the Experience Sampling Method (Csíkszentmihályi, 1997) and a literature review concerned with game testing.

The idea behind the intrusion method is that when users are interrupted while the application is paused during runtime, they will still be able indicate quantitatively how much they want to keep on going, because the assumption is that users still want to continue the experience, even if the experience is paused or stopped.

In order to investigate engagement it is also essential to explore subjective user experiences *during the process* and let them reflect in more detail on *what* makes them want to continue – and *why*. The ESQ thus focuses on exploring the specific elements of an

interactive experience that makes the user want to continue the experience, as well as to what degree he or she wants to continue.

The ESQ devised in this project was intended to interrupt respondents before the application started, at various points during the experience and finally after the experience. The ESQ is meant to be implemented as a pop-up online survey, which makes it possible to evaluate games and interactive experiences both in labs and at respondents' homes. The pop-up questions are then triggered by the game at certain points during the experience, where investigations of continuation desire are needed. The components and categories described in the Player Engagement Process framework in Paper I are furthermore used to organise the open-ended questions in the ESQ as follows:

- a) What motivates the player to begin the experience (before the experience: objectives)?
- b) What makes the player want to keep continuing or not – and why (during the experience: objectives, activities, accomplishments, affect)?
- c) What makes the player want to try again or not – and why (after the experience: objectives, activities, accomplishments, affect)?

Table 1 shows the questions included in the basic version of the ESQ.

<b>ESQ Part One: Demographics</b> (gender, age, frequency and amount of playing, favourite game / genre etc.)							
<b>ESQ Part Two: Before the experience</b>							
Q1. Please indicate below the extent to which you agree or disagree with this sentence: "I want to begin the experience" (to quantify the users Continuation Desire (CD))							
Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly	Other
Q2. "What makes you want/not want to begin?" (to identify the user's CD and objective)							
<b>ESQ Part Three: During the experience</b>							
Q3. Please indicate the extent to which you agree or disagree with this sentence: "I want to continue the experience now!" (Response options as in Q1)							
Q4. "What makes you want/not want to continue and why?" (to identify the source of the user's CD, objective and intended accomplishment)							
Q5. "What do you feel now?" (to indicate the user's affect)							
Q6. "What do you want to do next?" (to identify the user's activity and objective)							
<b>ESQ Part Four: After the experience</b>							
Q7. Please indicate the extent to which you agree or disagree with this sentence: "I want to try again" (to identify the source of the user's CD, objective and accomplishment) – (Response options as in Q1)							
Q8. "What makes you want/not want to try again (in the application / experience) and why?"							
Q9. "What do you feel now?" (to indicate the user's affect)							

**Table 1.** The Engagement Sample Questionnaire.

Although the method can be applied to all kinds of interactive experiences and types of digital games, Paper II focuses on evaluating engagement in interactive narratives through a case study of the First Person Victim application. The results and findings from this study are presented in Section 5.

### 3.2.1 Discussions and Reflections

Even though there is limited documentation in the literature concerning runtime self-report surveys as a tool for investigating engagement as continuation desire, it is not a novel approach to conduct runtime investigations of user experiences. Nevertheless, the ESQ and the intrusion method contribute through a straightforward stand-alone engagement evaluation method, which also can be used as a supplement to different

evaluation methods concerned with other concepts. It is furthermore an advantage that it is possible to conduct online surveys with no interference from the researcher in respondents' homes. When comparing the online data acquisition with in-game, think-aloud and observational approaches, there is also no need to transcribe qualitative data.

On the other hand, the ESQ includes so many open-ended questions that it might be expected that some respondents might answer with less enthusiasm and reliability at the end of the evaluation session. One way to save their time and to avoid bias when analysing answers could be to use closed-ended questions (with nominal or ordinal scales). These questions could be tailored to the application and should be concerned with the objectives, activities, accomplishments and affect components and their categories, in order to acquire quantitative data about these aspects. In such questionnaires, there should also be an option to respond 'other', in order to give the respondents a chance to report other qualitative answers.

The ESQ could also be combined with different approaches such as runtime think-aloud sessions, interviews, focus groups and observations, in order to further validate and supplement the current approach. Other methods such as psycho-physiological measures (e.g. Mandryk et al., 2006; Bateman & Nacke, 2010) may moreover be used to support the method.

Future work could refine and expand the data acquired from the current ESQ with additional runtime metrics such as events and application-defined objectives, as well as captured user activities and accomplishments. It would then be interesting to attempt to correlate this data with continuation desire ratings. If it is possible to establish these relations, the findings might assist in developing novel theories about engagement and the desire to continue. Furthermore, such relations could perhaps help to make predictions about the level of continuation desire in games and interactive applications based on the nature of events happening during runtime.

By investigating the intrusive method and continuation desire through the ESQ there is potential to gain more knowledge about what makes users engaged or disengaged. This process-oriented data on what users dislike or value in an interactive experience can furthermore be generated from runtime investigations of continuation desire. This feedback can then be used to rethink game design or fine-tune interactions, in order to improve an experience or to create novel interactive and engaging concepts.

In conclusion, this part of the project combined the PEP framework and in-game evaluation methods found in the literature to contribute an intrusive method of inquiry, including online pop-up surveys based on the ESQ. This method can be used to evaluate continuation desire as an aspect of engagement in interactive experiences, games and interactive narratives. The resulting knowledge from such investigations is intended to be used to evaluate a range of interactive experiences, and apply the feedback to develop more engaging experiences. The method will be applied in the case study concerned with the design and evaluation of the First Person Victim prototype in the next sections.

# 4

## Designing for Engagement

One ambition of this project is to use a player's engagement and continuation desire as a foundation for the design of interactive narrative experiences. Papers III, IV and V all address the related research questions concerned with how player engagement can be used as a driver in such experiences. This section accordingly focuses on the exemplification of the application of the player engagement process framework introduced in Paper I in a case study concerned with the design for engagement in the 'First Person Victim' interactive narrative experience.

In order to exemplify the application of the player engagement framework, I could have used other experimental applications such as 'Dear Esther' (Pinchbeck, 2008) or commercially available products such as 'Heavy Rain' (2010) as subjects for analysis and evaluation. Nevertheless, I found it more useful to work closely together with other colleagues and students to develop an interactive emergent narrative based on embedded events with serious content. It would then be possible to control the design, as we could use my initial findings as an inspiration during the development of the application.

An interactive emergent narrative – 'The First Person Victim' (FPV) – was therefore developed in cooperation with research assistants and M.Sc's in Medialogy, Faysal Fuad Khalil and Jawid Faizi. The basic elements of the FPV application were implemented by Faizi and Khalil during their Master studies (Faizi and Khalil, 2010) under the shared supervision of Associate Professor at Medialogy, Luis Bruni, and me. This prototype was later improved, enhanced and refined when Faizi and Khalil were hired after their graduation as my research assistants for further development of the project.

The FPV application intends to use the concept of interactive narratives and tragedy to address issues concerned with being a victim of war by implementing a war scenario as seen from the perspective of civilians. The FPV opposes the classic genre of violent, interactive shooter experiences by allowing the users to experience what it feels like to be in the line of fire instead of wielding the gun. The user therefore takes on the role of a victim and is able to witness the dramatic events that can take place in war zones. Although the experience uses First Person Shooter conventions, it heads in the opposite direction by restraining the users and letting them experience what it is like to be an unarmed civilian who is unable to use weapons and violent acts during runtime<sup>2</sup>.

In Paper IV we describe the actual experience of the FPV in more detail. In this paper, the ideas about using tragedy as a format, the issues related to violence in games and how they can be used constructively are addressed. However, these topics are not crucial for the purpose of answering the research question in this section, and Paper IV is thus included in the dissertation in order to provide a supplementary understanding of the background of the development of the FPV.

The primary intention of implementing the FPV application is to develop a tool for teaching aimed at schools and high schools. The experience of the FPV may then be used as a starting point for a guided discussion on the consequences of war and the situations of refugees. Since students should talk about the theme after the experience, it might support the discussion that students have different experiences (e.g. Squire and

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<sup>2</sup> See a teaser trailer at: <http://www.youtube.com/watch?v=Zs5P2H2s3z0>

Jenkins, 2003), so it is therefore important that the interactive narrative provides the possibility to trigger a variety of encounters and events.

Nevertheless, the choice of an interactive narrative also involves the challenges of the narrative paradox and the combinatorial explosion. One of the potential solutions could be, as described in the Introduction chapter, an interactive emergent narrative, where the user is confronted with the theme through the encounter of various events while experiencing navigational freedom in an interactive 3D world.

The exploration of integrating interactivity with a plot-based narrative in this project is therefore inspired by the overall possibilities of emergent narratives as a story constructing activity. An emergent narrative is experienced through the user's own story generation, which is based on the encountered embedded events (e.g. Jenkins, 2004) and/or characters (e.g. Louchart et al., 2008a). However, any interactive world with one or more narrative events and characters will create the potential of story construction activity among participants. The challenges thus lie in a) how to structure these events, in order to enhance the narrative potential for dramatic experiences, while avoiding the combinatorial explosion and the narrative paradox, and b) how engagement can be sustained among participants in emergent narrative experiences with non-pleasurable content.

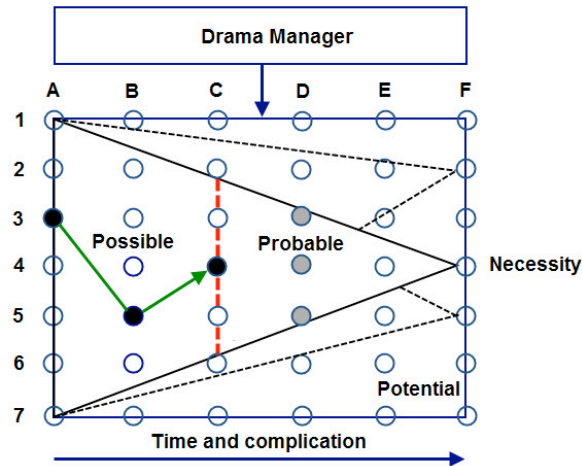
## 4.1 Structuring events in an interactive emergent narrative

The Introduction chapter established the problems inherent in the narrative paradox (i.e. the freedom of interactivity vs. the communication of the narrative (e.g. Aylett, 1999)) and the combinatorial explosion (i.e. ever-evolving branching structures (Stern, 2008)). Papers III and IV describe how these problems can be addressed by implementing a structure of pre-authored embedded events inspired by Brenda Laurel's concept of 'the flying wedge' (Laurel, 1993).

In Paper III, we introduce a method to structure these events with the Interactive Dramatic Experience Model (IDEM), which can be used to embed narrative events in a 3D virtual environment so that the freedom of spatial interactivity is kept intact and the evolution of the branches of the story is restrained while maintaining the possibilities for a variety of story constructions. The IDEM is furthermore intended to let users have more freedom to navigate in an open virtual environment, while at the same time allowing the author to maintain a degree of control over the communication of a theme.

While Paper IV briefly introduces the approach, Paper III explains the idea behind the model in more detail. The structure of the model is organised by a 'Drama Manager' and is intended to maintain the user's freedom to navigate through an open environment while letting the author control the communication of a theme.

In this structure the user begins the experience by having the potential to encounter a number of events in one area of the environment (in this case, seven events in location A on the far left in Figure 5).



**Figure 5.** The Interactive Dramatic Experience Model: The flying wedge eliminates available possible events to a few probable ones, and then finally to a single necessity (the climax) (Paper III).

As the user navigates through the world (the arrow) there will be fewer and fewer potential events to encounter. The probable events (the grey circles) are based on the triggering of former events (the black circles), and as the user moves forward the possible events (white circles) are eliminated. In the end, at the final location (F), the user will only have one necessary event to encounter, which in the case of the FPV is one climax out of seven possible with a tragic ending.

The implementation of the structure and the influence taken from the users' interactions will therefore enable them to experience different dramatic events changing in tension within a variety of storylines, possible experiences and user-generated story paths that are very different.

The application is implemented using the game engine Unity (Unity, 2012), which makes it possible to communicate the theme in a 3D environment with both visuals and sound. The Interactive Dramatic Experience Model places the narrative elements and events in both time and space, and these events are presented in the form of audio, video and additional text messages via an in-game mobile phone. The videos consist of sequences performed by real actors, and they are inserted into the 3D environment as video textures on 2D planes. The use of real actors in these videos is intended to ensure more detailed expressions from the characters, which would require far more resources to implement using 3D modelled and animated individuals.

The experience avoids any kinds of characteristics from games, which could lead to an interruption of the dramatic tension, such as non-theme-related challenges, goals and rewards. However, since the experience is divested from most traditional player engagement triggers related to war games, the question remains how the design of the experience can maintain engagement.

## 4.2 Sustaining engagement in an interactive emergent narrative

Even though the IDEM organises causal-related events both in time (sequential events) and space (the environment), the participant can still use a lot of time to roam freely through many locations in the experience. In order to make this free navigation more interesting, player engagement was applied in order to make the participant want to continue the experience.

Since the user is meant to experience what it is like to be a civilian in a warzone, he or she cannot use violent acts in order to proceed. Therefore, it is necessary to use triggers of engagement other than the traditional violently oriented drivers in war games, such as destruction, feeling satisfaction over a well-performed head-shot or completing missions by eliminating enemies. In order to use alternative unconventional triggers to drive users through the interactive emergent narrative, the process of designing the FPV was guided by using some of the identified causes from the PEP framework as drivers.

Papers IV and V include descriptions of how these categories of continuation desire were used to design for sustained engagement in the FPV. In the following, these design guidelines will be summed up and exemplified in relation to the four components – objectives, activities, accomplishments and affect – introduced in the PEP framework in Paper I. Some of these examples are illustrated in Figure 6 and are described below.

### *Objectives*

With the FPV we attempt to enhance users' drive and desire to continue while maintaining the freedom of interaction by combining a variety of potential user-defined *intrinsic objectives* with a few application-defined *extrinsic objectives*, in order to engage, motivate and drive the participant forward.

Papers IV and V describe how planning for intrinsic motivated, user-defined objectives (described as the extrinsic goals to the game in Paper IV) may help sustain engagement in an emergent narrative where the user might not experience events that are causally related.

In emergent narrative experiences such as FPV it is important to design for an experience which is driven by user-defined, intrinsic motivated objectives; the designer might not know how the user is going to navigate within the environment and which events he or she might encounter. Therefore, the user should have the desire to continue not only through the experience of the story and characters, but also through his or her objectives. The intrinsic objectives set up by the user may, for example, be triggered by uncompleted events, with explicit effects (e.g. cries for help) and implicit causes (e.g. a trapped person in a burning building). These events may then trigger curiosity and the desire to continue exploring the environment further and to seek more information, in order to reveal the cause of the witnessed event.

Game or application-defined, extrinsically motivated objectives (described as the intrinsic goals of the game in Paper IV) may also support the desire to continue. However, we experimented with minimising the amount of application-defined goals in order to make the FPV an experience which resembles a war situation, where chaotic events are encountered and there are no specific goals to achieve and no directions on where to go. Furthermore, we avoided obvious game-defined objectives, such as finishing levels, finding keys, destroying enemies, getting higher scores or experience points, which might make the user lose the intensity of the narrative experience and the involvement in the theme.

## *Activities*

The desire to continue in an emergent narrative may also be supported by the activities that users perform while they pursue an objective. In the case of the FPV we have accordingly chosen to experiment with activities which do not interfere with the theme.

Users may thus primarily become engaged through the desire to continue by *experiencing the story* and *meeting characters*. These events are embedded in the environment at various locations in order to sustain engagement (e.g. meeting a woman who asks for help to find her family). Users should therefore be driven by their interest in encountering new events through their curiosity.

The only way to interact in the current version of the FPV is to navigate through the environment. Therefore, *sensing* the environment (by observing the events and locations) and *exploring* the locations are activities which are also triggered to maintain the desire to continue.

The FPV moreover supports *experimentation* whereby users are meant to try out different possibilities and experiment with different endings to a story. Finally, users should also be encouraged to want to continue in order to attempt to *solve* problems (like helping other civilians trapped in burning buildings).

In the FPV users are thus also eyewitnesses to events, which encourages altruistic actions that should trigger the desire to continue (for example, when trying to help a person in a burning car, before it explodes). However, such actions are not supported because of the intended lack of user affordances and interaction possibilities in the design. Actually, the tragedies played out are caused by the users' own navigation in the environment (without their knowledge), and these events are intended to trigger a continuous load of negative emotions related to the theme, since it is not possible to rescue other characters in the experience.

## *Accomplishments*

In the FPV there are no traditional game accomplishments to achieve. Although the user can *progress* through the environment, there are no scores or levels to accomplish, and there are no *achievements* with which to be rewarded. Even if the user wants to continue in order to *complete* the experience, the experience ends without closure at the most tragic incident. This can, for example, happen when a user realises that it is not possible to save another character, who is gunned down. However, it is still possible to complete intrinsic objectives, i.e. when a user sets up his or her objective, for example to get out of a burning building.

## *Affect*

It is essential for the design of the FPV to sustain engagement, as the experience is concerned with a theme which could trigger non-pleasurable emotions in the user and thus disengagement. The FPV is therefore designed to support feelings such as curiosity and suspense instead of the conventional feelings related to games such as fun, enjoyment and pleasure.

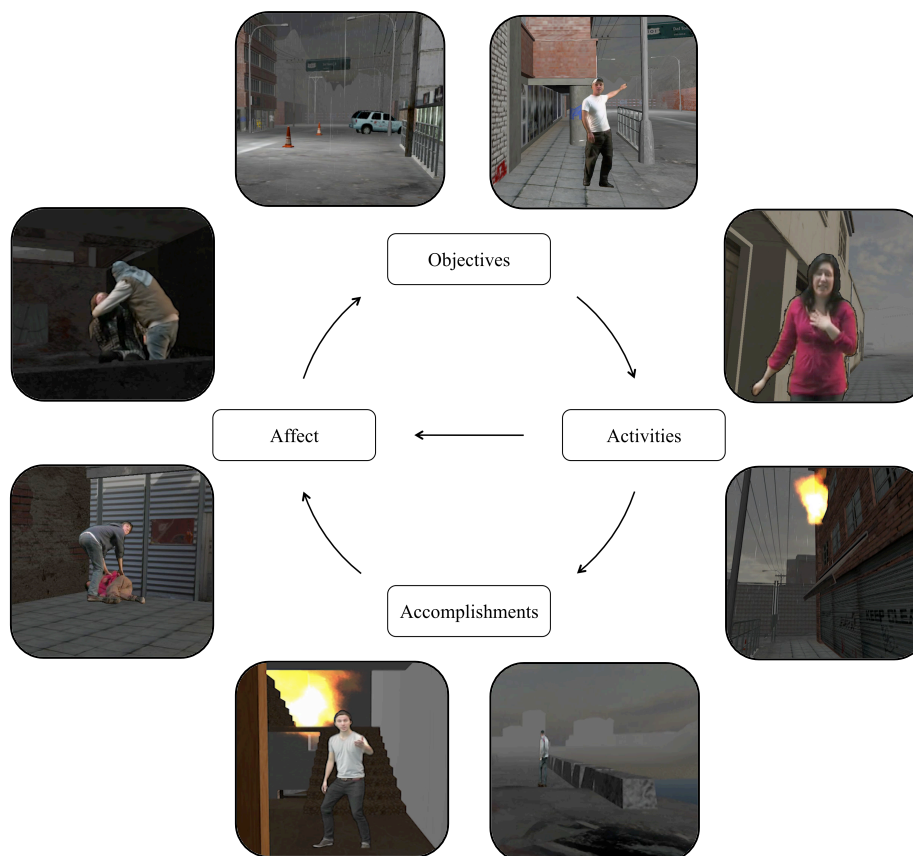
The desire to continue through the feeling of curiosity may consequently be triggered by the following activities: experiencing the story and characters, sensing and exploration of the environment, experimentation with possible outcomes of the story and attempts to solve problems like helping civilians. Moreover, it is also essential that the resulting affect can be caused by the experiences of theme-related negative affect. This could, for example, be shock (e.g. when the user's exploration triggers exploding rockets),



meaninglessness (e.g. when the user may feel that problems cannot be solved) and confusion (e.g. when users might not know where to go), in order to mediate the experience of being in a war situation.

Summing up, Figure 6 exemplifies the use of the PEP framework in the OA3 model. The examples are illustrated clockwise:

- Objectives:
  - Intrinsic objective: exploring the environment, looking for information.
  - Extrinsic objective: a character leads the way out of the town and suggests where to go.
- Activities:
  - Experiencing the story and characters (meeting a woman who is looking for her family).
  - Solving problems (trying to help a woman on the second floor in a burning building).
- Accomplishments:
  - Progressing towards a bridge which leads out of the town.
  - Completing the intrinsic objective of getting out of a burning building with the help of a neighbour.
- Affect:
  - Frustration, when not being able to help people, who are being shot without warning.
  - Meaninglessness, when it is not possible to help a woman who is being harassed.



**Figure 6.** Exemplification of player engagement in the First Person Victim in the OA3 model.

The approach of applying the PEP framework in the design for engagement is also described briefly in Paper V, which is concerned moreover with the learning aspects of the FPV. These contributions are described in more detail in Section 6.

## 4.3 Discussions and Reflections

The descriptions and findings in Papers III, IV and V demonstrate that the components and categories identified in the player engagement process can be used as a guideline for designing for engagement in emergent narratives.

Any game designer will obviously focus on designing engaging experiences, in order to create a compelling game for the player, and it is by no means a novel idea to design for engagement. Nevertheless, when game designers talk about creating engaging experiences, they usually refer to fun and enjoyable encounters (e.g. Klug and Schell, 2006; Koster, 2004; Schell, 2008; Lazzaro, 2008a;b). However, the investigation of the player engagement process shows that players also might want to continue due to a range of reasons other than fun and enjoyment.

Moreover, when using player engagement in the design of interactive applications, and especially interactive narratives, it is essential to base the experience on the intended context and the theme, which may not be fun-based. When used to communicate a serious topic, knowledge about player engagement can thus be used to trigger the desire to continue, while causing some form of affect related to that theme.

It remains to be considered how the player engagement process could be used to design other types of experiences. However, the findings related to the case study of the FPV show that there is potential for planning an experience based on the PEP framework and the findings in Paper I.

Pilot tests of the FPV described in Papers III and IV suggest that it is possible to create an experience where the user has free spatial interaction and navigational freedom. Additionally, users are still able to understand the theme conveyed through the narrative while maintaining engagement. Nonetheless, this does not prove that we have solved the narrative paradox, since the interaction is limited to navigation only, although the findings demonstrate that the attempt has been successful in relation to the variety of unique experiences and story generations among users, as well as the communication of the theme. The FPV contains 42 different events, so users have the ability to construct a range of very different emergent narratives (see Paper III for further details). The acquired data in the pilot tests also demonstrates how individual accounts of the narrative differ from one user to another. Therefore, these results can be used to support the idea behind the design of an interactive emergent narrative, which should lead to a variety of story-constructions. With additional resources, future work could also include other types of interactivity and 3D animated characters, in order to enhance the experience further.

Conclusively, the findings suggest that it can be beneficial to use the PEP framework as a foundation for the design of interactive emergent narratives. It is essential not only to focus on what makes an experience enjoyable or fun, but also more importantly to drive users forward through the experience. This can be achieved through the use of the triggers of continuation desire, such as supporting intrinsic objectives by means of curiosity, problem solving, sensing, exploration, experimentation, progression and completion, as well as experiencing the story and characters.

Furthermore, by using the various categories of causes of continuation desire in the design process, it is possible to orchestrate and plan user experiences through a

structured approach. The PEP framework, the OA3 model and an understanding of the desire to continue amongst players may thus assist game developers and interactive experience designers in the development of engaging applications.

The next section will use the FPV prototype to exemplify how the evaluation methods developed in Paper II can be used to conduct detailed evaluations of engagement in the FPV described in Papers II and V.

# 5

## Evaluating Engagement in the FPV Application

In the previous section, details about player engagement from Paper I described how to sustain engagement in an interactive emergent narrative and how to use that knowledge in a concrete case to design for engagement in the First Person Victim (FPV) experience.

In this section, the FPV will be used to exemplify how continuation desire can be evaluated with the intrusive evaluation method and the Engagement Sampling Questionnaire (ESQ), which is introduced in Paper II and described in Section 3.

During the initial development of the FPV application, several other initial evaluations of the experience were also conducted. The results from a pilot test which evaluates the general experience of the FPV are described in Papers III and IV. These findings suggest that users experienced an ability to navigate freely, they understood the theme and they were also emotionally involved in the events that concerned other characters, as they often tried to help them.

Paper IV describes this pilot test in more detail and shows that users in general were curious to explore the environment and were motivated to continue despite the grave and tragic content. In particular, users also desired to continue in order to experience the final outcome of the narrative. In general, the users in these pilot tests wanted to try the experience again, which indicates a desire to continue and thus engagement.

### 5.1 Application of the Intrusion Method and the Engagement Sample Questionnaire

While Papers III and IV investigate the overall experience of the FPV, Paper II uses the in-depth intrusion method and the ESQ to evaluate the FPV in detail. This evaluation was conducted at both Aalborg University, Copenhagen and during my visit to the Gambit Lab at MIT in Boston. Respondents were invited to test the application online from home (n=11, Medialogy students, Aalborg University) as well as in a lab setting (n=11, game students and staff, MIT).

The basic questions of the ESQ concerned with the level of continuation desire and reasons for wanting to continue<sup>3</sup> were modified by adding extra questions in Paper II (Q3, Q6-9, Q14-18). These questions are related to the content, narrative and feelings caused by the experience of the FPV. Finally, additional questions concerned with the communication of the theme and the learning aspects were used to explore the learning outcomes in Paper V and to assist in improving the experience for future use in schools, high schools and colleges.

An online survey was prepared, and before starting the application, respondents were asked to answer the first sections of the ESQ. After completing these questions, they should then proceed by beginning the experience and exploring the environment until the first event was encountered and a pop-up screen directed them to the next questions. After each of the six events, the application would pause and respondents should then answer the pop-up questions in the next part of the ESQ. These questions were

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<sup>3</sup> See Table 1 in Section 3.

concerned with how much they wanted to continue, what made them want to continue and what they experienced and felt at that point. After the last event, the final part of the questionnaire inquired about the desire to try the experience again.

The findings are based on an analysis of answers to the open-ended questions from the ESQ. The four components of the player engagement process introduced in Paper I were used to organise the results in reported activities, accomplishments, objectives and affect. Table 2 shows the responses related to what made respondents want to or not want to continue their experience.

Activities	Accomplishments	Intrinsic Objectives (Self-defined)	Extrinsic Objectives (Application-defined)
Explore the environment (Navigate)	Completion	Find cues, information, people, exits or novelties. Help other civilians. Explore the whole environment. Try other ways to proceed. Get to safety, escape or flee. Get in and out of rooms and buildings or get out of the city. Survive.	Find the friend at the shop (after phone call event 'A5'). Avoid being shot by soldiers (after shooting event 'E3'). Get away from helicopter (after chopper attack event 'C5').
Experience the story and characters	Advancement	Experience what is going on. Experience what happens next.	None.
Experiment	Completion	See how it is going to end. Experiment with the application. Try to find other endings.	None.

**Table 2.** Reported activities, accomplishments and objectives (Paper II)

The results in Table 3 also demonstrate that the respondents encountered a variety of emotions, while some users stated that they experienced a negative affect due to the tragic narrative and serious theme. Many of the accounts concerned with negative affect also referred to technical problems.

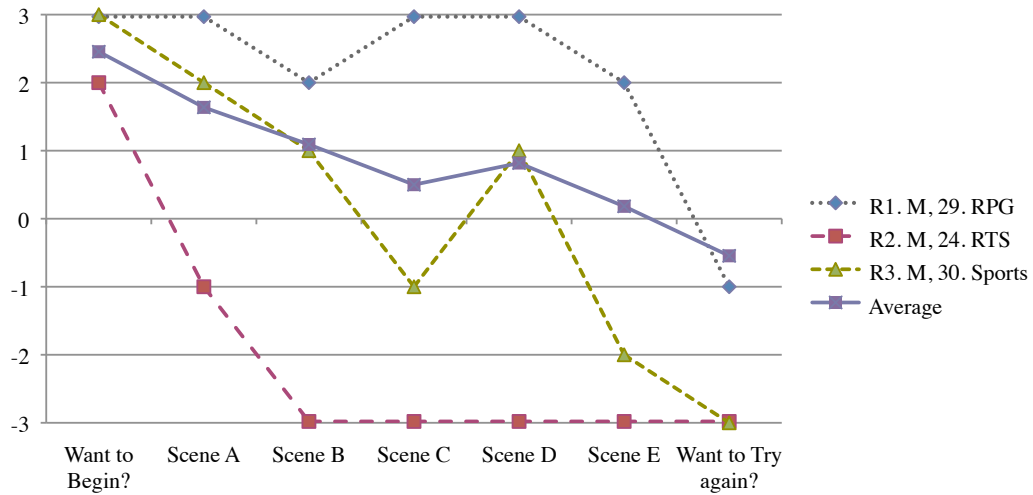
Positive affect	Curious, in suspense, intrigued, interested, startled, relaxed/relieved (after the experiences), enthralled/engaged, captivated by the setting.
No affect	Indifferent.
Negative affect-Technical related	Confused, lost, annoyed, frustrated (controls).
Negative affect-Narrative related	Agitate, nervous, excited and anxious, tense, wired, shocked, dizzy, fearful, worried, frustrated (cannot help others), powerless, angry, miserable, sick, desolated, bored, empty, frightened, scared, paranoid.

**Table 3.** Reported affect (Paper II)

The method of indicating a user's level of continuation desire – or how much they want to continue – is exemplified by three representative users with major differences in their experiences. The individual continuation desire levels reported by these three users are depicted in Figure 7.

Scenes A-E mark the level during runtime, while the beginning and end of the graph show how much the respondents wanted to begin the experience and to try it again. The graph demonstrates a few of the variations in the level of continuation desire during runtime in the FPV, and the results illustrate that some participants quickly became bored (R3) while others wanted to continue to a higher level (R1). Some respondents also experienced that they became more motivated to continue after a period of less interest when certain events happened (R1 and R2). Their reported narrative experiences were also very personal, which indicates that the emergent narrative structure supports a great deal of different story constructions and experiences.

An average continuation desire level based on users who did not stop the experience before the last event is also included in Figure 7. However, this average only indicates how the overall level of continuation desire progresses during the FPV experience, due to the variety of the constructed narratives and experiences among different users in an emergent narrative.



**Figure 7.** Continuation desire levels. The number ‘3’ indicates “Agree strongly”, ‘0’ signifies “Neither agree nor disagree” and ‘-3’ means “Disagree strongly”. (Paper II)

The reasons for wanting to continue or not among these three respondents in the different scenes are exemplified in their own words in Table 4.

<p><b>R1:</b> Male, 29. Genres: Role-play, Adventure and Strategy. Favourite game: “Fallout 1”</p> <p>Do you want to begin? Strongly agree. “Sounds like an interesting concept”.</p> <p>Do you want to continue? Scene A: Strongly agree. “I’m curious about what happens next”.</p> <p>B: Agree moderately. “I still want to continue, but I would like to be able to interact with objects. Also, I don’t have any idea about where I’m going. I feel I’m running around aimlessly”.</p> <p>C: Strongly agree. “Now there are more things happening, and I feel that it actually matters what I do. I like what happens when you get shot”.</p> <p>D: Strongly agree. “I got captivated by the setting”.</p> <p>E: Agree moderately. “It seems like there are no other places to go. I might go and hike in the mountains, though”.</p> <p>Do you want to try again?: Disagree a little: “I feel that I explored everything I could”.</p>
<p><b>R2:</b> Male, 24. Genres: Real-time Strategy, Action, FPS, Puzzle, Quiz. Favourite game: “Starcraft 2”</p> <p>Do you want to begin? Agree moderately. “I’m interested in what the game is about and how it looks”.</p> <p>Do you want to continue? Scene A: Disagree a little: “Low mouse sensitivity, boring graphics”.</p> <p>B: Disagree strongly. “Weird dialogue and glitchy game elements”.</p> <p>C to E: Disagree strongly. “Same reasons as before”.</p> <p>Do you want to try again? Disagree strongly. “As mentioned, it was boring and very unfinished. The lack of other persons and realism made everything very dull”.</p>
<p><b>R3:</b> Male, 30. Genres: Sports, Adventure. Favourite game: “FIFA 2010”</p> <p>Do you want to begin? Strongly agree. “I am interested!”</p> <p>Do you want to continue? Scene A: Agree moderately. “I don’t know what is going on”.</p> <p>B: Agree a little: “I still don’t know what is going on yet. I want to figure it out”.</p> <p>C: Disagree a little. “The experience of seeing the person in the car die was tough. I could not help him and lost control. I am confused whether to rescue myself or help others. I am not sure what I can do...”.</p> <p>D: Agree a little. “I want to call someone and figure out what is going on”.</p> <p>E: Disagree moderately. “The woman was shouting for help but I could not help her. That feels horrible...”.</p> <p>Do you want to try again? Disagree strongly. “This is quite a horrible experience”.</p>

**Table 4.** Sample ESQ continuation desire responses (Paper II).

The overall findings from Paper II show that, in general, 36% wanted to try the experience again. Those respondents who did not want to continue stated that technical problems were an important reason. Game design problems such as boring content due to the level design were also mentioned as causes of disengagement. Finally, some users who were engaged during the experience did not want to try again, since they felt that they had seen everything the experience had to offer.

On the other hand, the overall results indicate that some participants, who wanted to continue during runtime, also experienced various negative emotions related to being a

victim of war during the test, for example meaninglessness, helplessness and frustration. However, this did not make them want to stop the experience. These findings suggest that engagement can occur, even if the experience is not rewarding, pleasurable or fun – emotions, which traditionally have been the subject in studies of uses and gratifications (e.g. Sherry, 2006). However, if the events, for example, are perceived to be too grave, disengagement can also occur among those respondents who did not want to try again due to negative affect related to the theme (e.g. R1).

In general, the results indicate that participants were being engaged by exploring the environment, problem-solving (trying to help others) and finally curiosity about the story and characters.

The study from Paper II additionally included a discussion with researchers and students at the Gambit Lab at MIT, which was carried out after one test session and documented through video recordings<sup>4</sup>. Overall, the same results as seen in the online survey were observed during the discussion. It was however also evident in the discussion that these participants were surprised when they realised that each of them had experienced a very different story due to the emergent narrative concept. This motivated some of them to try the application again, in order to experiment with the outcomes of the story. The different experiences also initiated a range of discussions about the feelings of helplessness when the participants realised that there were no possibilities to help the victims. Both during the in-game test and in the course of the discussion, participants reported that the theme of the scenario was war, and that the application was concerned with how it feels to be a helpless victim during an attack.

## 5.2 Reasons for Continuation Desire among pupils in schools

Since the evaluation in Paper II was conducted with university students and staff, it did not address the intended target group directly. Therefore, the evaluation in Paper V focuses on how the FPV experience would be evaluated in an actual school setting among pupils in three public lower-secondary schools.

Based on the findings in Paper I the assumption is again that engaged pupils will report that they want to try again or continue the experience when being interrupted.

The evaluation in Paper V concentrates on three aspects: an investigation of the willingness to continue; an exploration of the participants' feelings during the experience of the FPV and finally the potential of using the FPV as a tool in teaching, which will be addressed in Section 6. The FPV was evaluated with three different methods in Paper V: a post-game online survey after playing, runtime observations and in-class discussions (See Figure 8).

After the pupils had played for 15-30 minutes they were told to stop, in order to answer an online survey before they continued with the in-class discussions. In total, 40 pupils participated in the survey. The results show that 40% clearly wanted to continue playing, while 32% did not want to try again and 28% were undecided.

In-depth observations of the four pupils and the survey illustrate that respondents who wanted to try again were engaged due to intrinsic objectives and the following activities: exploration, solving problems, experimentation as well as experiencing the characters and story. Furthermore, these respondents also wanted to continue mainly because of positive elements from the design and the theme. The engaged respondents experienced more negative feelings related to the theme than both the group of

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<sup>4</sup> This discussion is available as an online video at MIT News (Whitacre, 2011).

respondents that did not want to continue and the group of respondents that was undecided.



**Figure 8.** Playing the First Person Victim in a class setting. Observation of two pupils playing.

Respondents from the group that were not willing to continue playing stated that their decision was mainly due to technical problems and game design issues. This group did not report having experienced as many emotions related to the theme as the other groups and they mostly stated that they did not feel anything in particular.

The findings hence suggest that even when the engaged pupils reported that they had experienced negative feelings related to the theme, and that those feelings were not fun, enjoyable or pleasurable, they still wanted to continue. These results indicate that the theme-related affect may be the result of the activities included in the PEP framework, e.g. exploration and experiencing the characters.

### 5.3 Discussions and Reflections

The detailed evaluations in Papers II and V indicate that about 40% of the respondents experienced sustained engagement in the first 10-15 minutes of the experience, and they also wanted to try again.

These findings cannot be generalised, as they only include a limited number of respondents, different target groups and a single prototype. Nevertheless, the results can still be used to exemplify how information about engagement can be obtained with the intrusive method and the ESQ. The findings indicate that the main reasons for not wanting to continue were technical issues, lack of events and negative emotions related to either the design or the theme. These results illustrate the limitations of the prototype, as the findings demonstrate that technical problems affect the level of continuation desire and thus the engagement. Future work will be needed to improve the organisation of the events. The technical problems should also be addressed in order to reduce the number of participants who did not want to continue or were undecided, thereby potentially increasing player engagement in the FPV.

Nevertheless, it is important to note that disengagement due to negative affect also may be a sign of the successful communication of a serious topic, since the negative emotions related to the tragic theme might make participants unwilling to try again.

The results also show that among the group that wanted to continue, a negative affect, such as feelings of hopelessness, frustration and powerlessness mostly occurs due



to content and theme not only due to problems with controls and lack of agency in the game.

As the overall samples were non-representative, further investigations are needed to generalise the findings. The risk of bias, which can occur when analysing answers to open-ended questions, should also be addressed in further studies. For example, the answers concerned with the reasons for wanting to continue or not could be organised in categories. These categories could then be used to quantify the causes of engagement and disengagement in future investigations of the FPV. Game preferences, personality and game literacy, which also could have an effect on the result, are not taken into account in this study, so further investigations of these parameters will also be required in order to identify the relations between engagement and such factors.

When evaluating interactive emergent narratives such as the FPV, it is essential to explore how player engagement can be sustained despite the tragic content. Also, it is important to investigate whether users are motivated to continue due to aspects other than 'positive' facets of engagement such as enjoyment, fun, flow and pleasure. Therefore, it might be useful to combine the intrusive method and the ESQ with other methods such as game inquiries with the iGEQ (IJsselsteijn et al., 2008) or other approaches intended to evaluate interactive narratives (Vermeulen et al., 2010).

The findings suggest that even with the grave content in the FPV, users might still experience a desire to continue, because they want to explore the environment, solve problems, experience the story and characters and experiment with the application and alternative endings. If the evaluation had focused on exploring other concepts conventionally related to engagement, such as enjoyment, fun, flow and immersion, some of these results might not have been acquired.

In conclusion, the studies in Papers II and V show that the evaluation method introduced in Paper II can be used to explore and quantify the continuation desire aspect of engagement in interactive emergent narratives such as the FPV. Findings from the case study reveal that there is a lot of information about a user's willingness to continue, which can be acquired through interruptions during runtime. Furthermore, when evaluating the communication potential of interactive narrative experiences, the ESQ is also a valuable method for acquiring information.

The findings in Papers II-V moreover show that around 40% of all participants wanted to try the prototype again or continue, despite technical problems and level design issues. This result suggests that there is potential for using conventions from games and player engagement, which are usually related to enjoyable experiences, to drive users through emergent narrative game-like experiences with unconventional and non-pleasurable content. In the FPV, those users who wanted to continue the experience stated that it was because they wanted to explore the environment, solve problems, progress through the environment, experience the characters and the development of the story, as well as completing and experimenting with the story.

These causes of continuation desire are similar to those we intended the users to experience when we designed the FPV. The results therefore suggest that the PEP framework is beneficial as a guideline in the design for engagement in the FPV. In general, the findings also indicate that knowledge about continuation desire can be used to design for engagement and to analyse the willingness to continue in interactive emergent narratives. Nevertheless, technical issues and level design problems need to be addressed, in order to engage more users.

The next section will describe how the PEP framework can be used in the design of interactive learning applications and in an analysis of the learning situation. The potential of using the FPV application as a tool for teaching serious topics will also be investigated.

# 6 Engagement in Interactive Learning Scenarios

The research question concerned with how interactive experiential learning scenarios such as the FPV can be developed and evaluated by using player engagement as a design and evaluation framework is addressed in Paper V. In this paper, the contributions from Papers I, III and IV are combined, in order to use the First Person Victim application (FPV) for teaching purposes.

Paper V describes in more detail how the FPV can be considered as an experiential learning scenario. This paper also contributes with an account on how the PEP framework and conventions from games may be used to motivate and keep pupils engaged, so that they can be taught about the serious issue of being a victim of war.

The following subsections will address the aspects of motivations for learning and experiential learning in more detail than in Paper V, in order to explain how these concepts supported the design of the FPV.

## 6.1 Motivations for Learning and the Player Engagement Process

In order to design for engagement and sustaining the motivation to learn in the FPV among pupils, I chose to compare the categories from the PEP framework with the factors of intrinsic motivations for learning identified by Malone and Lepper (1987).

Their seminal paper is selected because it describes which elements are needed to design intrinsically motivating instructional environments, where students are motivated to learn without external rewards or punishments. It is thereby possible to identify the relations between the causes of engagement that users report as the reasons for wanting to continue and the various motivational factors for learning from the taxonomy. The factors of individual motivation for learning are: *challenge*, *fantasy*, *curiosity* and *control*, while the interpersonal motivational factors are *cooperation*, *competition* and *recognition* (Malone and Lepper, 1987). In Table 5 the categories of the PEP framework are related to Malone and Lepper's factors of intrinsically motivated learning, which makes it possible to demonstrate how the causes of continuation desire can lead to intrinsic motivation for learning.

As shown in Table 5, there is a relation between each of the identified general factors from Malone and Lepper (1987) and the detailed categories of the PEP framework. The comparison indicates that players today still may want to continue playing and be motivated to learn by the same aspects of intrinsic motivation as identified 25 years ago. This is also the conclusion that Habgood et al. (2005) reached through their investigation of Malone and Lepper's work and by referring to the game industry veteran G. Penn.

<b>PEP Framework</b> (Paper I) <i>Players report that they want to continue due to:</i>	<b>Intrinsic Motivations for Learning</b> (Malone and Lepper, 1987) <i>Player engagement may support these intrinsic motivations for learning:</i>
<b>Objectives</b>	Challenge: Both short and long term goals Challenge: Uncertain outcomes
Intrinsic*	Challenge: Goals generated by learners Cognitive curiosity
Extrinsic*	Challenge: Fixed game defined goals
<b>Activities</b>	
Interfacing	Control: Contingency and response Challenge: Performance feedback
Socializing	Competition, Cooperation
Solving*	Cognitive curiosity
Sensing	Sensory curiosity
Experiencing the story*	Cognitive curiosity Fantasy: Emotional aspects and identification Fantasy: Cognitive aspects – metaphors and analogies Fantasy: Endogeneity and integration
Experiencing the characters*	Fantasy: Emotional Aspects and identification Fantasy: Cognitive aspects – metaphors and analogies Fantasy: Endogeneity and integration
Exploring *	Control: Choice Cognitive curiosity Sensory curiosity
Experimenting*	Control: Choice Cognitive curiosity
Creation	Control: Choice Control: Power Cognitive curiosity
Destruction	Control: Power
<b>Accomplishments</b>	
Progression*	Challenge: Self-esteem
Achievement	Challenge: Self-esteem
Completion*	Challenge: Self-esteem
<b>Affect</b>	
Positive*	Challenge: Self-esteem Reputation
Negative*	(if none of the motivational aspects are present, negative affect like boredom can occur)
Absorption	Challenge: Optimal level of difficulty for the learner (=Flow)

**Table 5** Comparison between the PEP Framework (Paper I) and Malone and Lepper's Taxonomy of intrinsic learning (1987). A '\*' means that the respondents mentioned that category as a reason for wanting to continue during the experience of the FPV in Papers II and V.

The work by Malone and Lepper can thus be used to support the idea behind the design of the FPV based on the PEP framework. Users in the evaluation of the FPV in Section 5 namely report a range of objectives, activities, accomplishments and affect, which may

trigger the motivational factors for learning in Malone and Lepper's taxonomy (these incidents are marked with an '\*' in Table 5). In future work it could furthermore be interesting to empirically investigate the relations between the player engagement categories and the motivational factors in more detail by using the ESQ and intrusion method to identify and compare causes of the desire to continue and the motivations to learn.

## 6.2 Player Engagement and Experiential Learning

Since this part of the project is concerned with informing and teaching about serious issues through an interactive game-like emergent narrative experience, it can furthermore be beneficial to use the concept of experiential learning as a foundation and inspiration for the design of such applications.

The process of experiential learning as described by Kolb (1984) is composed of a cycle of four stages. Learning according to this model can begin at any of the four stages, but usually it starts with a concrete experience, where learners must be open-minded and have to be able to involve themselves fully in the experience without bias. Then the learners should gather information through observations from various perspectives in order to reflect on the experience. In the following stage, learners may generalise their findings and create concepts that can organise the observations in theories and hypotheses about the experience through abstract conceptualisations. Finally, learners might conduct active experimentation in new situations, in order to test the hypotheses, and should then be able to use the theories for problem-solving and decision-making. According to Kolb, "Learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p.38).

The process of experiential learning bears similarities with the process model of player engagement, because both learners and players may perform activities during their experiences. Learners and players may also both reflect on those experiences and form ideas and hypotheses that are used to set up new, self-defined intrinsic objectives, which they can try out by performing new activities during active experimentation. The results of these experiments could possibly either lead to the accomplishment of the objective, positive affect and deciding on a new objective which sustains engagement or to the abandonment of the objective (e.g. due to negative affect, for example frustration over the controls) and subsequent disengagement.

The fundamental concept of experiential learning can thus be described as experiences that learners can reflect upon, form ideas about and experiment with. In order to design for engagement in such experiences the motivational factors suggested by Malone and Lepper (1987) can then be used to support engagement by concretely implementing categories from the PEP framework, for example possibilities to explore, problems to solve and triggers of intrinsically motivated objectives. This approach is similar to what was described earlier in Section 4.

### 6.3 Learning through the First Person Victim experience

As mentioned, the FPV is intended to be used in combination with an in-class discussion in schools and high schools, in order to address a serious topic. Test sessions at three Danish schools were conducted (n=40) in order to explore the potential for using the FPV as a tool in teaching.

An evaluation of the scenario in Paper V, based on the evaluation methods introduced in Paper II and combined with observations, indicates that around 40% of the participants became engaged despite the depressing content. Additionally, feelings related to the theme such as hopelessness, confusion, loneliness and fear were reported to be encountered by participants. However, game design issues concerning the limited amount of events encountered and technical problems were also reported in this study as reasons for not wanting to continue. The survey in Paper V moreover shows that the pupils who were engaged felt that they learned something related to the theme more frequently than those in the groups that did not want to continue or were in doubt.

The teachers who were interviewed after the discussion sessions (n=7) commented that they observed their pupils participating actively in the discussions. Some teachers also reported that a number of usually quiet pupils – especially boys – had been more active in the reflections and discussions than normal. According to the feedback from these teachers, applications such as the FPV might have potential as a tool in teaching and as a facilitator for discussions about a specific theme.

### 6.4 Discussions and Reflections

The findings from the in-game observations, post-game surveys and in-class discussions in Paper V suggest that learners may go through four stages that are somewhat similar to those described in Kolb's (1984) experiential learning model. This could potentially happen on two levels. The first level is in-game experiences and learning which takes place during gameplay. The second level is concerned with learning during in-class discussions, which take place after the experience.

On the first level – in-game – the learner is presented with a world where it is only possible to navigate and thereby observe various embedded events. The experience of the first events in an apartment during the initial airstrike might trigger the learner to reflect on these events. For example, it is possible to experience a phone call from a confused friend who wants to meet at a shop. However, the learner might not know where this shop is, but still reflects on the experience and may set up a hypothesis that the friend must be somewhere outside the building and set up an objective to find the friend, actively experimenting with the navigation in order to try to find the exit to the apartment. When the learner comes out onto the street several different events can happen, one of which is a woman screaming for help. Suddenly, the first objective – finding the shop – might no longer be so important, and by observing where the screams are coming from, most learners might try to find this woman in order to help her. However, as the learner moves up a narrow staircase the upper part of the building explodes and the staircase is blocked by debris and fire. The learners may reflect on this experience, and observations show that many still try to get through the burning inferno by experimenting with jumping over the obstacles in order to get to the woman. But her screams for help cease and most learners come to the conclusion that they were not able to help her.

On this level, participants might thus be observing the experience (e.g. by navigating through the environment and witnessing different events), reflecting on it (e.g. questioning what the different events meant, and where to go next), conceptualising ideas based on their reflections (e.g. suggest possible ways out or how to help someone) and finally conducting active experimentation in order to test the ideas (e.g. trying to attack a soldier by jumping on him). The player engagement process furthermore shows similarities with Kolb's model on the grounds that the components of objectives, affect and accomplishments describe the drive that learners can experience, when they perform active experimentation in order to investigate their hypotheses. For that reason, I agree with Kiili (2005), who states that the Kolb model "stresses the continuous nature of learning and the appropriate feedback which provides the basis for a continuous process of goal-directed action" (Kiili, 2005, p. 17).

On the second level – in-class discussions – learners may also go through the stages mentioned by Kolb (1984). During these discussions they might reflect on their experience of the application both on a technical level (e.g. video-recorded actors instead of 3D characters) and game design level (e.g. lack of weapons), as well as on thematic and contextual levels. Learners might also reflect on a more thematic level when they mention feelings of helplessness, powerlessness and an inability to help others due to the lack of affordances. During these discussions participants may also realise that everyone has had different experiences due to the nature of the emergent narrative structure. By combining their experiences and reflections participants are able to conceptualise ideas and begin to see the bigger picture portraying the tragic events that are unfolding. It is also evident in the post-experience discussions that when participants realise that their experiences have been unique, they state that they become motivated to try the experience again so that they can experiment with the hypotheses they have formed during the discussions.

Moreover, the findings indicate that the FPV can be seen as an exemplification of how pupils can learn about serious issues in a *designed experience* (Squire, 2006) by "doing and being" (ibid., p.32) in an experiential learning scenario.

Nevertheless, another metric is *what* the participants actually learnt during the experience. In-game observations in Paper V suggest that the focus is primarily on learning game mechanics. Conversely, the post-experience self-report survey indicates that especially participants who wanted to try again, and to a lesser degree those who were undecided, they learned topics and encountered emotions related to the theme. Although the results suggest that learning occurs, these results cannot be generalised based on the current data. Further studies, which focus on the learning outcomes, will be required to corroborate these results.

In conclusion, feedback from the evaluations in Papers II-V indicates that the FPV has the potential to communicate a serious topic by allowing users to encounter a variety of emotions related to the feeling of being a victim of war, especially among respondents who reported that they became engaged in the experience. The post-game in-class discussions and feedback from teachers indicate that there is potential for using interactive experiential learning scenarios like the FPV as a tool for learning. Furthermore, the findings in Paper V also suggest that player engagement can drive pupils through a non-fun, game-like experience, even if the experience is not necessarily pleasurable. Nevertheless, in order to acquire a higher potential for sustained engagement and learning outcomes among participants, it is necessary to address the technical problems and to improve the FPV experience by focusing on feedback from disengaged users. Finally, future work is needed to investigate the learning outcomes of the FPV and the comparison with Kolb's model in more detail, in order to generalise the findings.

# 7

## Player Engagement and Teaching

As a final additional example of the use of the findings, this section briefly describes how the player engagement process introduced in Paper I can be applied in other fields related to learning, such as teaching. During my PhD studies, I have lectured on a variety of courses in which I have taught subjects such as animation, screen media, integrated systems design, game design and development, motion capture animation and interactive narratives at Medialogy. Furthermore, I have also supervised different Bachelor and Master projects within these subjects. During my daily job of teaching and supervising students, I realised early in this project that my findings concerned with player engagement might be used as an inspiration for motivating students during teaching. This section thus focuses on the research question concerned with how student motivation can be supported by knowledge about player engagement.

Together with my colleague, Lars Reng at Aalborg University's section of Medialogy, I have co-authored two papers (Paper VI and VII) concerned with student engagement through problem-based learning, game design and innovation.

Paper VI describes the concept of problem-based learning (PBL) and how we use game design and this method of teaching at Medialogy to engage artistic students in learning the more technical elements of the curriculum. The approach is exemplified by describing various examples of Bachelor projects, where problem-based project work combined with students' interest in game design have motivated artistic students to become engaged in learning technical topics. Paper VII reiterates the background information concerned with the PBL approach at Medialogy, and focuses on how innovation can be used as a motivational factor for students during game design projects. In these papers, we conclude that students in general may become engaged when they experience that they have a goal with a purpose, their skills meet the challenges and their efforts are rewarded. Furthermore, aiming at developing for innovative solutions might also engage students.

The area of problem-based learning is not the main focus of this project. However, it may be interesting to draw parallels between the PEP framework and this method of teaching. The various examples of projects described in detail in Papers VI and VII thus demonstrate how the approach of working on a problem-based project can be compared with the player engagement process.

Our experience shows that having not only an *extrinsic objective* (e.g. passing the exam with a highest possible grade) but also a self-defined *intrinsic objective* may help artistic students become more engaged in learning technical topics such as programming (e.g. developing an innovative gameplay by combining the First Person Shooter genre with Real Time Strategy in the 'Rise of the Resistance' project, or a novel holographic game interface in the 'Petri Cube' project to support social interaction). It is also important that the problem of the project has a purpose (e.g. support teaching molecular structures to 8<sup>th</sup> grade students in an actual school with the 'Sci-Vi' learning game). This purpose may then trigger an *intrinsic objective*, which might intrinsically motivate student to continue developing the project further (as per Malone and Lepper's intrinsic motivations for learning (1987)).

The *activities* that students might perform during the pursuit of their objectives are mainly *problem solving* in nature, but there are also other activities we should consider:

- *exploring* the field (through review of state of the art products and literature)
- *experimenting* with possible solutions,
- *interfacing* with technology (e.g. impact vests, biofeedback technologies, augmented reality software and 3D game engine software)
- *creating* innovative games through design and development
- *socialising* in their daily work with other members of the group.

These activities might support the desire to continue working with the project and may thus engage students further in their projects.

During their project work, students may also experience a range of *accomplishments* when they *complete* elements of the project (e.g. making an augmented reality system work), when they *progress* through the different iterations of developing a game, when they gain more and more knowledge about the technologies and when they *achieve* their grade following an exam.

The project work might also help students to experience both negative and positive *affect*. For example, if their skills do not meet the challenges, they might experience frustration and may be forced to re-evaluate or even abandon their original objective. However, as their abilities to program and their knowledge about the technology increase, more complicated challenges can be met. Therefore, the chance of feeling successful or in ‘flow’ might be improved where there is a balance between skills and challenges (Csíkszentmihály, 1990).

## 7.1 Discussions and Reflections

Although the experiences from supervising the projects described in Papers VI and VII are merely examples, they indicate that the player engagement process may also be used to investigate engagement among students.

Nevertheless, it is evident that future work in this field should include much more comprehensive and in-depth investigations in order to validate and generalise the findings, which are based purely on our experiences of supervising problem-based learning projects at Medialogy. Such investigations could focus on sampling levels of engagement and motivations for continued engagement with the project during an entire semester and over several years. Knowledge about student engagement acquired through from the use of the intrusion method and the engagement sampling questionnaire could possibly aid in creating teaching formats, which could then be employed to support sustained motivation among students.



# III Conclusion

# 1 Summary of the Research

This research project has revolved around three main themes addressing the main problems of the project, namely how to describe engagement in interactive experiences, how to evaluate engagement and how to apply the findings to a range of applications which use engagement as a driver. This section will recapitulate the project through a summary of the research and contributions related to each of these three themes.

## 1.1 Player Engagement as Continuation Desire

In the initial phases of this project, the objectives were to address the narrative paradox and to develop a method for creating alternatives to rigid and plot-based interactive narrative structures. However, it quickly became obvious that if the freedom of interaction is to be maintained, there is a need to introduce a driver other than traditional, causal-related dramatic structures in order to motivate participants to progress through interactive narratives. Since engagement can be argued to be an essential driver in any experience, I initially chose to investigate that concept in more detail, with a particular focus on engagement in digital games.

Contemporary studies have compared and related engagement with other concepts such as fun, enjoyment, flow, immersion and presence. However, it can also be argued that an essential facet of engagement is the willingness to continue an experience. Therefore, I decided to focus on investigating the continuation desire aspect of player engagement.

In an attempt to identify the causes of player engagement based on an empirical investigation, qualitative responses from a range of open-ended online surveys were gathered. The questions were concerned with identifying what motivated players to begin the experience, to continue it and to try it again.

Exploratory research and grounded theory were then applied to analyse and organise the data. The analysis identified several causes of continuation desire, which were then used to develop a process-oriented framework of player engagement.

This project has thus contributed with the Player Engagement Process (PEP) framework, which may help explain the concept of engagement in interactive media and games. Furthermore, the causes of continuation desire when playing a digital game contribute to understanding player engagement in greater detail.

Based on the findings, player engagement may be described as a subjective individual experience which is initiated by the player's motivation to begin playing. The player can then become engaged and driven by the desire to continue. This desire may be caused by one or several triggers or causes of engagement. These causes can be clustered into 18 categories, which furthermore can be assembled in four components: *Objectives*: intrinsic or extrinsic; *Activities*: interfacing, socialising, solving problems, sensing, experiencing the story, exploring, experimenting, creating and destroying as well as experiencing the characters; *Accomplishments*: achievement, completion and progression and finally *Affect*: positive, negative and absorption. The relationships between these four components

suggest that player engagement can be described as a process where a player has the desire to continue a variety of activities while wanting to accomplish either self-defined intrinsic objectives or extrinsic objectives set up by the game whilst experiencing some variety of affect.

Player engagement may also be related to a range of experiences (e.g. the feeling of being immersed, present or in flow) and emotions (enjoyment, fun, satisfaction, etc.), which might be a part of a player's experience of engagement, depending on his or her own subjective experiences and the type of game played. However, affect is a special component of engagement, which can cause both player engagement and the desire to continue (e.g. by setting up a new objective after having experienced a feeling of satisfaction following an accomplishment) and be a result thereof (e.g. enjoyment). Based on the findings, I thus argue that the affective aspects of engagement – such as fun, enjoyment, immersion and flow – may in fact be the results of player engagement and the willingness to continue, rather than the central explanatory characteristics of the concept of engagement. Within the field of digital games the experience of player engagement can thus be argued to be the prerequisite of a successful game experience. Continuation desire is therefore a fundamental aspect of the user experience, as well as for experiencing immersion and flow while playing.

Player engagement may likewise be experienced on a moment-to-moment basis in the game during play and out-of-the-game when a player is not playing but has a desire to play. Moreover, players might also be engaged over a longer period of time, when they commit themselves to coming back to play a game again and again. Player engagement can thus also be explained by the tenacity, perseverance and determination to continue an experience. Players may in fact stay engaged and continue playing because engagement is a powerful cyclic process, in which players are continuously exposed to an ongoing sequence of objectives, activities, accomplishments and affect which makes them want to continue in a positive feedback loop.

## 1.2 Do you want to continue? - Evaluating Engagement

This project additionally contributes with two methods which can be used to evaluate engagement in interactive experiences such as games and interactive narratives. Both methods are developed based on the PEP framework.

The Player Engagement Ranking Method (PERM) organises and quantifies respondents' qualitative descriptions of their desire to continue in the 18 categories of continuation desire introduced within the PEP framework. This method is meant to be used to compare different target groups and games as a supplement to quantitative investigations.

The intrusion method and the Engagement Sampling Questionnaire (ESQ) are used to identify respondents' experiences of engagement before, during and after the experience. Since they may become engaged through their willingness to continue, this aspect of engagement can be evaluated by investigating continuation desire. By interrupting the experience during runtime with the intrusion method, and by asking people to assess their desire to continue, it is possible to indicate a level of engagement over time. Furthermore, the events in the interactive experience which trigger the desire to continue (or to disengage) can be identified during the interruptions. The nature of these events can then be compared to the level of continuation desire, and thereby information about the relation of types of events and engagement may be revealed. Moreover, the ESQ also includes open-ended questions concerning the reasons for wanting to continue, through which further knowledge about the experience of

engagement may be obtained. Both methods can thus be used to assess and understand in more detail the experiences of continuation desire.

### 1.3 Driven by Player Engagement

It comes as no surprise that engagement is a powerful driver in digital games, so game designers obviously strive to engage players in order to make them keep playing their games. With the PEP framework, I have attempted to contribute a systematisation of these engaging experiences based on a qualitative investigation into what players report as the reasons for wanting to continue playing. The framework can be applied to a range of uses, and in this project I focused on the design of interactive narratives, the evaluation of such experiences, continuation desire as a driver in tools for learning and finally player engagement as a motivational factor for students in university teaching.

First of all, I used the PEP framework with colleagues as a foundation for creating an interactive narrative prototype – the First Person Victim (FPV) – which addresses the serious issues concerned with being a victim of war. The results from evaluating the FPV demonstrate that the framework can be used as a design guideline when developing interactive experiences. Knowledge about player engagement can then be applied to drive users through experiences that are not engaging according to the traditional descriptions in the literature (e.g. fun and enjoyable).

Secondly, an evaluation of the FPV among university students and staff, based on the intrusive method and the ESQ, demonstrates that users also may become engaged in the FPV through different triggers of continuation desire. This happens when they perform certain activities such as exploring the world, experiencing the story and the characters, solving problems by attempting to help other characters and trying to accomplish closure by completing the experience. Users also report that they want to continue mainly due to their self-defined objectives, since there are only minimal extrinsic objectives set up by the application. The findings also demonstrate that engaged participants report a range of theme-related negative feelings such as hopelessness, angst, fear and meaninglessness.

The knowledge about engagement thus helped me to focus the design on how to drive users forward in an interactive emergent narrative such as the FPV. These findings consequently suggest that conventions from game design and player engagement can be exploited as a driver in emergent interactive narrative experiences, even when the content is not fun or enjoyable. The evaluations also demonstrate that around 40% of the respondents experienced sustained engagement in the first part of the experience, and they also wanted to try again despite the tragic content. However, the main reasons for not wanting to continue in the prototype were reported to be technical problems and level design issues, which leaves some room for improvement.

Thirdly, the ESQ and the intrusive method were also used to evaluate engagement and the potential for using the FPV as a tool for learning in three public schools. The feedback indicates that the students who were engaged reported more frequently than the disengaged students that they experienced feelings related to the theme and that they thought that they had learned something about being a victim of war. This implies that player engagement may be used as a driver for communicating content through the mediation of emotions.

In-class discussions, which were conducted after the evaluations, suggest that disengagement due to negative feelings related to the theme can also become a success criterion for communicating a serious topic, as the grave content is then fully understood. Feedback from teachers furthermore shows that some students who were normally rather quiet ended up contributing more than usual during the follow-up

discussions. Teachers also stated that there is potential for using applications like the FPV to initiate discussions about a range of serious topics.

Finally, I also attempted to relate the PEP framework to my own experiences as a teacher. The framework can potentially shed light on how non-technical students might be motivated to learn technical topics through problem-based project work and the objective of developing games. In addition, it may also help explain how students may become engaged in their project work by being challenged to create and explore innovative solutions to game design problems.

The contributions of this project can thus be summed up as follows:

- Classification of 18 main causes of continuation desire in digital games based on qualitative surveys.
- Identification of related major triggers of disengagement in digital games.
- Characteristics of the four components of player engagement: objectives, activities, accomplishments and affect, as well as their relationships.
- The OA3 model based on these characteristics.
- The Player Engagement Process (PEP).
- The Player Engagement Ranking Method (PERM).
- An intrusive method and the Engagement Sample Questionnaire (ESQ) for evaluating continuation desire in digital games and interactive storytelling.
- Description and application of an approach intended to design for engagement in interactive emergent narratives. Case: The First Person Victim (FPV).
- Exemplification of the use of the evaluation method and the ESQ for the exploration of continuation desire in the FPV.
- Evaluation of the potential for using interactive emergent narratives and experiential learning scenarios such as the FPV as a tool for learning in public schools.
- Comparison of the PEP framework with my own experiences of supervising students who became engaged through problem-based learning, innovation and game design.

# 2

## Discussion and Perspectives

In addition to the discussions and limitations of each description of the various contributions in the Contributions Chapter, this section will reflect on the methodology used and describe potential future work, as well as the perspectives of the project.

### 2.1 Methodological Reflections

Concerning methodological considerations, using the exploratory research approach and grounded theory has proven to be advantageous in the investigation of the many aspects of the desire to continue playing. The use of this method has resulted in a detailed understanding of the player engagement process and a range of triggers of continuation desire.

There are myriad explications of engagement and related concepts in the literature, and I could have chosen to use one of those and its associated factors, items or categories as a foundation for the description of engagement and the design of interactive emergent narratives. I could also have used well-established questionnaires about other concepts, which are usually related to engagement, for an evaluation of the resulting applications. Nevertheless, I do not fully agree with their items, as they mainly focus on what I see as the outcomes of the activities and accomplishments that make users want to continue, and not only the reasons thereof.

Furthermore, if a survey with closed-ended questions based on theoretical findings with a predefined range of categories of engagement triggers had been used, the results would not have opened up new findings in the field. Consequently, I chose an alternative approach and started almost from scratch, in order to explore the foundation of engagement by identifying the triggers of continuation desire. On the other hand, I also contemplated whether the way in which I initiated my study – with an exploratory research method and grounded theory based on empirical data – had the potential to yield new findings in the field. Nonetheless, the feedback from senior scholars and discussions at international conferences, where I have presented my work, indicate that this approach was constructive, since my contributions have resulted in new knowledge about the continuation desire aspect of engagement.

### 2.2 Perspectives

The PEP framework is intended to be used as an academic foundation for analysing, categorising, mapping, evaluating and measuring engagement in both digital and non-digital interactive experiences. A comprehensive framework of player engagement is a necessary foundation for the analysis and evaluation of games and interactive experiences.

Several international research groups seem to have focused on the ‘fun’ aspects of games and interactive experiences, and not on exploring the fundamental triggers and causes of the desire to continue as an aspect of engagement. Therefore, the contributions

of this project will also be beneficial for initiating inter-disciplinary fields of research where methods and theories are combined to further understand user experiences.

Nevertheless, the framework was not only developed as an academic research tool, but is also intended to be a foundation for creating new ideas, concepts and applications focused on engaging interactive experiences. Another feature of the framework is that it can be used as a design guideline. Knowledge about the triggers of continuation desire can potentially be utilised by interaction designers when designing for engagement and to develop novel kinds of education applications, new forms of interactive documentaries or entertainment and alternative ways of communicating a variety of serious themes. The four components of the PEP framework, their relationships and the related categories of causes and triggers which support the willingness to continue are also intended to be used to structure experimental interactive narrative experiences. As the findings concerned with the evaluation of the FPV reveal, such experiences may not only need to be driven by cause and effect alone, but also through triggers of continuation desire. This finding also suggests that the PEP framework can be used as a source of inspiration for ideas about novel types of experiences in the rising digital and real-world experience economies.

As games increasingly become mainstream media, conventions from playing games and the knowledge gained in this project about how games engage players can be used to drive users through novel forms of engaging in interactive experiences and learning applications. This project demonstrates that such experiences do not necessarily need to be fun, enjoyable or pleasurable in order to engage users. Knowledge about how to engage people may thus have a substantial impact on how to communicate serious issues in such media. Especially in education settings, where yet another new generation is growing up familiar with being entertained by games, this could be an interesting subject to investigate further. In such environments there is great potential to use this drive as a motivator in 'serious' communication mediated by interactive storytelling, media technologies as well as in purposive games. The development of the First Person Victim application furthermore supports the idea that the PEP framework can be used as a guideline in the design of interactive storytelling experiences. Additionally, the evaluations of the FPV demonstrate that the intrusive method and the ESQ can be used to investigate such user experiences and the learning outcomes of experiential learning scenarios.

Ongoing discussions in the public sphere about addiction to games are a completely different, yet essential ethical aspect of this project. These discussions demonstrate that the negative consequences of playing are often related to the holding power of digital games (e.g. Ermi and Mayra, 2003). Another study by Shea and Cairns (2008), for example, suggests that "the degree of immersive experience is closely related to how addictive or engaging people find video games and moreover that addiction seems to be an extreme form of engagement and immersion" (Ibid., 2008, p. 55). However, according to Charlton and Danforth (2010), there is "reasonable support" for the distinctions between (pathological) computing-related addiction and (non-pathological) high engagement in online game playing (Ibid., p 601). These two studies exemplify that results vary, as the field of addiction and digital games also is multifaceted and depends on evaluation methods and the definitions of engagement, high engagement, immersion and addiction.

Nevertheless, when designing for engagement one should be aware of ethical issues which might arise during the design of engaging applications. The power of player engagement thus needs to be addressed in any application of the framework. Additionally, the PEP framework might also have the potential to help understand addiction to playing digital games – a topic which could be explored in future studies.

## 2.3 Directions for Future work

The contributions of this research project represent the potential for many avenues of future academic work. For example, in order to further validate the framework, other target groups such as young children and elderly people could be asked what it is that makes them want to continue playing. The contributions concerned with the player engagement categories could also be compared in further detail with factors of related concepts, in order to illustrate similarities and differences. Moreover, the findings could be further corroborated by investigating the process of designing engaging games of more game designers in the industry.

The development of the FPV application is currently on stand-by. Nevertheless, the intention is to let it mature into an actual product, which could become available to teachers in schools and high schools at a later stage. However, the first objective for that project is to address the technical- and design-related problems of the current implementation of the prototype, in order to engage more students in the experience so that learning outcomes of the experience can be explored further. Ethical issues concerning the risk of affecting people in a damaging way with grave content should also be addressed before a potential product is launched.

The FPV is just one example of how to use the PEP framework for developing interactive storytelling applications with a communicative and educational purpose, and many great possibilities lie ahead in this field. A more specific design-oriented framework could possibly also be developed on the basis of the existing framework.

Furthermore, it would also be valuable to develop a general dramaturgic model of interactive emergent plot-based narratives by using the PEP framework. Such a model could assist in the composition of emotional user experiences based on the affect triggered through the causes of continuation desire. Different types of events could moreover be related to the categories of continuation desire that they may trigger. In this way it might be possible to orchestrate an emotional dramatic experience by using specific types of embedded events. Every single event may then cause the desire to continue, and subsequently a range of emotions might be triggered as a result of each event. The story and emotions may then be generated as a collaboration between the user and the interactive emergent narrative system through the encountered events as the story unfolds.

On a different note, the results from this project already have the potential to be used in a range of new ventures. For example, I have been invited by an international interactive storytelling research group from Scotland to test an updated version of the FPV prototype with an EEG brain scanner (RIDERS, 2012). On this project we will attempt to locate brain activity related to continuation desire and to correlate these findings with the intrusion method and the ESQ survey.

Since there is a well-established connection between digital games and learning (e.g. Gee, 2007; Salen et. al., 2007; Squire and Jenkins, 2003; Johnston et al., 2010) it would also be interesting to investigate further how the player engagement process can be applied in educational games and interactive experiential learning scenarios. Moreover, the engaging power of digital games can be used for experiences other than those encountered in front of a screen. Recently, researchers have been inspired by these possibilities to investigate how this characteristic of digital games can be used to address social problems and improve the quality of human life (McGonigal, 2011). Good and Su (2011) moreover give examples of how the qualities of games may engage people to play digital games which help to solve difficult scientific problems.

‘Gamification’ is a recently introduced term that describes this application of game design elements in non-game fields and contexts (e.g. Deterding et al., 2011). It would



therefore be interesting to explore how gamification and the PEP framework could be used to develop new forms of lecturing, group work, project work and teaching in general. My own – admittedly subjective – experience of teaching for over eight years indicates that students today have a shorter attention span, and they acquire knowledge in another way than when I began teaching at Medialogy. Gamification might thus be one way to motivate students of the future to learn in a different way.

Summing up, the contributions of this project may hopefully inspire future research and discussions on player engagement. Thus, the player engagement framework, the intrusive evaluation method, the Engagement Sampling Questionnaire and the wide range of potential applications of the findings in this project lay out many future endeavours in the field of engagement in interactive experiences.

# 3

## Concluding Remarks

Initially, this research project was motivated by the challenge of how to solve the problems of the narrative paradox and the combinatorial explosion in interactive narratives. Other researchers propose that potential solutions to these problems could be to envision interactive emergent narrative systems based on procedurally generated content and organisation of events. In these interactive emergent narratives users could then roam the environment and interact freely, while encountering a series of embedded events. There is no doubt that users will perform their own story construction and generate a variety of narratives in such environments. Nevertheless, it remains problematic and perhaps too complicated to convey good, well-told stories in such experiences. Moreover, how will these narratives be interesting and dramatic enough to sustain interest among all users?

The answer is a system which is capable of generating engaging stories in real-time and for everyone. Regrettably, such a system would have to be far better than the best storytellers of the world, in order to keep the interest of all participants. As any story told is not always capable of engaging every member of the audience, it is a daunting – if not impossible – challenge to conceive this kind of system. An alternative solution to such a system is our own brains, as also mentioned by Oatley (2011). Compared to computers, the mind is a superior story-generating engine. Feed it with a few events, and it will start making up stories.

With current technology it may be possible to generate a variety of embedded events on the fly, which can feed our own personal story engines. Nevertheless, the challenge still remains: how can we make sure that these generated stories are engaging? In other words, how do we keep the story engines driving?

These problems made me realise that perhaps the challenges of interactive storytelling had to be approached in another way; engagement, and what makes us want to continue in interactive experiences, should be the main driver in interactive emergent narratives with embedded events. The momentum of traditional linear cause-and-effect sequences of events is not the optimal solution to drive such experiences; if a high degree of interactional freedom could be maintained, this approach would lead to the combinatorial explosion.

With this research project I have therefore contributed with a detailed investigation of what drives us ahead in one of most engaging forms of interactive media: digital games. This dissertation has thus been an attempt to discover and articulate the multitude of causes of engagement in such games. The exploration has contributed with the Player Engagement Process framework and a number of methods to evaluate continuation desire. These findings can furthermore be used to design, analyse and map the user experience of engagement in interactive experiences and in other fields.

By exemplifying the application of these contributions through the First Person Victim prototype it has been demonstrated that it is indeed possible to harness the desire to continue and to utilise it to engage people in alternative interactive emergent narrative experiences with a purpose.

Yet, with this project I am aware that I do not contribute *the* solution to the challenges of interactive storytelling. I also do not think that I have discovered *the* conceptualisation of the process of player engagement or the related categories of continuation desire. Further exploration of the desire to continue and future investigations of player

experiences may identify new triggers and causes; consequently, the framework might need to be adjusted.

Nevertheless, it is the intention that the PEP framework, the intrusive method and the ESQ should inspire designers and researchers to continue the exploration of engagement as continuation desire in both the development, evaluation and analysis of interactive experiences and for other purposes. In particular, this project demonstrates that there is broad potential for applying the contributions for purposive interactive experiences and new forms of serious educational and communicative interactive narrative content.

Thus, if my contributions can initiate further discussions about continuation desire and create awareness about how player engagement can be used for new forms for interactive storytelling and for applications other than mere amusement, my quest has been completed.

*Imagine a beach.  
Imagine that you are walking along the beach.  
In the distance you suddenly notice a shimmering light....*

*- Are you hooked yet?*

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# Appendix I

Included Papers

# Papers included in the Dissertation

Papers are referred to by their roman numbers in the dissertation.

- I. The Player Engagement Process – An Exploration of Continuation Desire in Digital Games.  
Schoenau-Fog, H. (2011). In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.
- II. Hooked! Evaluating Engagement as Continuation Desire in Interactive Narratives.  
Schoenau-Fog, H. (2011). In: Si, M., Thue, D., André, E., Lester, J., Tanenbaum, J., Zammitto, V. (eds.) ICIDS 2011. LNCS, vol. 7069. pp. 219–230. Springer, Heidelberg. ISBN: 978-3-642-25288-4.  
*Conference proceedings paper (Best student paper award) – presented at The Fourth International Conference on Interactive Digital Storytelling. Vancouver, November, 2011.*
- III. Authoring for Engagement in Plot-Based Interactive Dramatic Experiences for Learning.  
Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2012). In: Transactions on Edutainment IX. ISSN: Springer, Heidelberg. ISSN: 1867-7207  
*Journal article (Accepted for Publication)*
- IV. First Person Victim: Using Interactive Drama and Tragedy to create Awareness about the Consequences of War.  
Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2010). In Meaningful Play 2010: Designing and Studying Games that Matter – Online Conference Proceedings. Michigan State University, East Lansing.  
*Conference proceedings paper – presented at Meaningful Play conference, Michigan State University, East Lansing, October, 2010.*
- V. Teaching Serious Issues through Player Engagement in an Interactive Experiential Learning Scenario.  
Schoenau-Fog, H. (2012). In: Mitgutsch, K., Wimmer, J., Rosenstingl, H. (eds.), Eludamos. Journal for Computer Game Culture. Vol. 6, no 1, pp. 53-70. ISSN: 1866-6124.  
*Journal article. (Top paper award) – Project presented at Future and Reality of Games Conference. Vienna, 2011.*
- VI. Using Problem Based Learning and Game Design to motivate Non-technical Students to engage in Technical Learning.  
Reng, L, Schoenau-Fog, H. (2010). In: GAME PLAY SOCIETY : Contributions to contemporary Computer Game Studies. eds. / Christian Swertz ; Michael Wagner. München : Kopaed VerlagsGmbH, 2010. pp. 27-39. ISBN 978-3-86736-240-5  
*Conference proceedings paper as book chapter – presented at Future and Reality of Games Conference. Vienna, 2010.*
- VII. Problem Based Game Design - Engaging Students by Innovation.  
Reng, L, Schoenau-Fog, H. (2011). In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.  
*Conference proceedings paper – presented at Think Design Play: 5th International DiGRA (Digital Games Research Association) Conference. September, 2011. Utrecht.*

# Paper I

## The Player Engagement Process - An Exploration of Continuation Desire in Digital Games.

*Conference proceedings paper*  
*Presented at Think Design Play: 5th International DiGRA Conference*  
*(Digital Games Research Association)*  
*Utrecht, September, 2011*

Schoenau-Fog, H. (2011). The Player Engagement Process – An Exploration of Continuation Desire in Digital Games. In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.

# **The Player Engagement Process – An Exploration of Continuation Desire in Digital Games**

**Henrik Schoenau-Fog**

Aalborg University, Copenhagen

Department of Architecture, Design and Media Technology

Section of Medialogy, Lautrupvang 15, 2750 Ballerup, Denmark

hsf@create.aau.dk

## **ABSTRACT**

Engagement is an essential element of the player experience, and the concept is described in various ways in the literature. To gain a more detailed comprehension of this multifaceted concept, and in order to better understand what aspects can be used to evaluate engaging game play and to design engaging user experiences, this study investigates one dimension of player engagement by empirically identifying the components associated with the desire to continue playing. Based on a description of the characteristics of player engagement, a series of surveys were developed to discover the components, categories and triggers involved in this process. By applying grounded theory to the analysis of the responses, a process-oriented player engagement framework was developed and four main components consisting of objectives, activities, accomplishments and affects as well as the corresponding categories of engagement, disengagement and their triggers – were identified and rank-ordered.

## **Keywords**

Player engagement, continuation desire, player experience, motivation, play studies

## **INTRODUCTION**

Successful computer games have remarkable capability to draw people in (Jennett et al. 2008), they glue people to the game (Rigby and Ryan 2011) and they make people want to keep playing (Brown and Cairns 2004). By their very nature, good games need to be engaging, so game designers use this knowledge to create great game experiences. It is not enough to motivate a player to begin playing – if the engagement is not sustained, the player will not keep playing. The main objective of this study is to explore the aspect of continuation desire as experienced from players' perspectives in order to acquire further understanding of the multifaceted concept of player engagement in digital games. The focus is thus to investigate empirically what it is that triggers player engagement and makes players want to continue playing, what they do while they have the desire to continue and which emotions, affect and experiences the desire to continue generate among players.

The fundamental triggers in games that cause players to experience engagement (and disengagement) while playing were identified by conducting a qualitative survey (n=41). Through grounded theory the responses were analysed and used to develop a process-oriented player engagement framework consisting of objectives, activities,

accomplishments and affect. The findings suggest that the affective elements of player engagement that are generally used to explain engagement are a result of the continuation desire aspect. In order to exemplify one application of the findings, the categories of the components were finally rank-ordered (n=131).

The findings are furthermore intended to be used to categorise player engagement, determine the engaging elements of a game or an interactive application, examine player experiences and analyse game characteristics based on the components, categories and triggers of player engagement.

## RELATED WORK

The experience of playing digital games has been studied in great detail both theoretically and empirically, and is described as a multidimensional and multilayered construct (Poels et al. 2007). Player engagement is one dimension of the experience of playing games and can be related to a multitude of concepts such as Flow (Csikszentmihalyi 1991; Chen 2007), Gameflow (Sweetser and Wyeth 2005), Presence (Lombard and Ditton 1997; Tamborini and Skalski 2006), Immersion (McMahan 2003; Brown and Cairns 2004; Ermi and Mäyrä 2005; Jennett et al. 2008), Pleasure (e.g. Costello and Edmonds 2009), Motivation (Yee 2006; Przybylski et al. 2010; Rigby and Ryan 2011), Enjoyment (Klimmt 2003; IJsselsteijn et al. 2008a) and Fun (e.g. Koster 2004).

Due to the many and various explications of these concepts, there is also a difference in terms of how engagement is understood and used when investigating player experiences. Lombard and Ditton (1997) include engagement as one aspect of the “psychological immersion” component of “presence as immersion”, which occurs when users encounter and become “involved, absorbed, engaged and engrossed” in mediated experiences (p.5). McMahan (2003) offers another explanation by stating, “To be so engaged with a game that a player reaches a level of near-obsessiveness is sometimes referred to as deep play” (p. 69). According to McMahan, this state of mind can become a way of assessing engagement so that “the term deep play [in video games] is a measure of a player’s level of engagement” (ibid).

In order to better understand how players engage with videogames, Jennett et al. (2008) focus on the concept of immersion by investigating their subjective experiences. According to their research, immersion is primarily a result of a good gaming experience and is thus critical to game enjoyment. While being immersed, *almost* all attention is focused on the game, because the players can still be “immersed in the game to some extent but they are not immersed to the exclusion of all else and therefore not in flow”. (p. 642). Furthermore, “immersion is evidently a precursor for flow because that sense of being so involved that nothing else matters is practically a colloquial definition of immersion” (p. 642). It is moreover described as an experience in one moment in time, and based on earlier grounded theory findings by Brown and Cairns (2004) immersion can be graded through three levels of involvement, namely engagement, engrossment and total immersion.

In the Brown and Cairns study (2004), engagement is defined as the lowest level of involvement which must be experienced before the player can become engrossed or totally immersed. A player should invest time, effort and attention while playing and must be interested in the game by overcoming barriers of player preference and learning of the controls in order to become engaged: “An engaged gamer is interested in the game and wants to keep playing” (p.1299). When the game directly affects the player’s

emotions, he or she can furthermore become engrossed, as there should be “[...] a high level of emotional investment in the game. This investment makes people want to keep playing [...]” (Ibid.).

Ermi and Mäyrä (2005) also investigate immersion and describe three dimensions in their gameplay experience model: sensory, challenge-based and imaginative immersion (SCI). Imaginative immersion occurs when players become absorbed with the world and stories, or begin to empathise or identify with game characters. Sensory immersion is associated with the audiovisual elements of games and challenge-based immersion is concerned with the balance of challenges and abilities.

Engagement has also been associated with enjoyment. Klimmt (2003) investigates why players begin, sustain and repeat playing and addresses the question of why playing digital games is so enjoyable by proposing a conceptual model. The model consists of three key dimensions of game enjoyment: 1) the experience of ‘effectance’ or the immediacy of feedback to the player, 2) repeated cycles of suspense and relief, curiosity and an increase in self-esteem and 3) the fascination of becoming part of an alternative reality and playing a new role in simulations of spatial environments and/or interesting narratives. According to Klimmt, “enjoyment is the reason for players to begin, sustain, and repeat exposure to digital games” (p 247).

Another elemental property of games which is also related to engagement is the possibility of playing and Brown and Vaughan (2009) propose that a central element of the concept of play is the desire to continue: “Play provides a continuation desire. We desire to keep doing it, and the pleasure of the experience drives that desire. We find ways to keep doing it. If something threatens to stop the fun, we improvise new rules or conditions so that the play doesn’t have to end. And when it is over, we want to do it again” (p. 18).

Several studies have investigated the overall player experience. Poels et al. (2007) explored the feelings and experiences people have when they play digital games by focusing on what occasions gamers typically start gaming, what they experience or feel while gaming and what they experience after gaming. Based on these findings and theoretical analyses of player experiences, Ijsselstein et al. (2008b) developed the Game Experience Questionnaire (GEQ), designed to quantify player experience through dimensions of immersion, flow, competence, positive and negative affect, tension, challenge and social presence. Van den Hoogen et al. (2008) used the in-game version of the GEQ questionnaire (iGEQ) to acquire data about players’ experiences during gameplay by exploring the dimensions of positive affect, boredom, frustration, flow, challenge, immersion and competence.

Other studies focus specifically on quantifying a player’s engagement. For example, Mayes and Cotton (2001) propose a construct, labelled “engagement”, that determines the quality of a video game experience. The concept is conceived based on the “outcome that is desired most by game developers: an enjoyable game” (ibid. p 692). The authors define engagement as “how fun, involving, and motivating a task is” (ibid.) and introduce an “Engagement Questionnaire” (EQ) intended to investigate five dimensions of engagement (interest, authenticity, curiosity, involvement and fidelity) which are thought to influence a player’s level of engagement while playing a digital game. Brockmyer et al. (2009) furthermore propose the Game Engagement Questionnaire (GEQ), developed to quantify the subjective experience of deep engagement, which, according to the



authors, is a combination of immersion, presence, flow, and absorption and that “the term ‘engagement’ will be used as a generic indicator of game involvement” (Ibid., p.624).

Finally, a number of studies are concerned with the overall motivational aspects of games. Przybylski et al. (2010) and Rigby and Ryan (2011) explain that the underlying reasons as to why people play, and how digital games can motivate sustained engagement, are due to their ability to satisfy fundamental psychological needs for competence, autonomy (freedom of choice based on personal interests) and relatedness (interaction with others).

The diversity of explanations regarding related concepts, the variety of definitions and the different empirical investigations associated with player experience and engagement illustrate the complex nature of the concept of engagement. In order to narrow the focus, the following section will present an explication of player engagement, which will be used as a foundation for exploring continuation desire and the process of becoming engaged while playing.

### **CHARACTERISTICS OF PLAYER ENGAGEMENT**

First of all, in order to distinguish between motivation and player engagement, it should be noted that the concept of motivation in this study is related to the reasons why people *begin to play* and why players are “lured into” a game and start playing. The concept of player engagement is concerned with aspects related to the playing situation and focuses on what makes people want to *continue playing* and what it is that “hooks” players so much that they want to keep playing. A player could, for instance, be motivated to begin playing due to boredom, but it is not until the player becomes excited and wants to continue playing that engagement is experienced.

In the current study, player engagement is understood as the level of continuation desire experienced in-game, during play or over a longer period of time, when players dedicate themselves to coming back and playing a game again and again. Player engagement is initiated by a player’s individual motivation to begin playing and is driven by continuation desire, which can result in perseverance, determination and tenacity. Player engagement is furthermore related to a range of emotions (enjoyment, fun, satisfaction, etc.) and experiences (e.g. the feeling being immersed, present or in flow) which may or may not be part of a player’s experience of engagement, depending on both the player and the type of game played.

These characteristics will be used as a foundation to develop surveys intended to identify the triggers and components of player engagement in the following investigation.

### **METHOD**

In order to conduct a detailed exploration of the continuation desire aspect of player engagement in digital games, information about this aspect was gathered. The investigation consisted of one main and two extra data collection surveys, all concerned with general gaming experiences, in order to discover as many different triggers of player engagement and disengagement as possible. Furthermore, open-ended questions were administered to avoid biasing respondents with predefined answers and categories based on theoretical investigations.

The main survey was used to develop the player engagement process framework. Media technology university students, who were interested in game design and had varying

levels of game playing experience, were recruited and instructed via email to answer questions in an online survey application. The questionnaire was based on the explication of player engagement and consisted of questions concerned with demographic issues, gaming habits and the following questions: “What in a game motivates you to play?” “What in a game makes you want to continue playing?” and “What in a game makes you want to come back to play?” In order to identify the triggers of disengagement, the question “What in a game does not make you want to continue playing?” was added. Finally, satisfaction was chosen as an example of emotional releases in the question “What in a game gives you satisfaction?”

### **Participants**

In total, 33 males (80%) and 8 females (20%) responded to the first survey (n=41). The average age was 23.5 years (range: 21-41 years). The respondents from this survey reported that the average time played per week was 9 hours, they played an average of two different games per week and 51% considered themselves gamers. A total of 7% were not playing games at the time of the survey. The answers indicated that the desire to continue playing occurred on a regular basis, exemplified by 95% of the respondents “wanting to keep playing” a “few times” (32%) or “many times” (63%). In addition, it was evidenced that playing can be a satisfying experience, as all respondents had experienced satisfaction either “a few times” (32%) or “many times” (68%) while playing.

### **Results and Analysis**

The responses from the first data collection resulted in 205 answers related to the five questions based on the characteristics of player engagement. The answers were cleaned up initially by rejecting useless answers, for example empty or incomprehensible responses, or too broad answers like “I keep playing because of the gameplay”. The answers were then separated into 312 statements. Grounded theory was used, as described in (Charmaz 2006), in order to identify the components and categories of player engagement, so the statements were organised and initially coded to extract the triggers of player engagement. The identified triggers were then checked further for reoccurring instances through focused coding, and finally grouped into 95 initial categories. The initial categories were then evaluated for similarities and grouped into 33 tentative categories with corresponding properties. These 33 categories were then reduced further to 18 conceptual categories in yet another iteration. For example, the statement “Being able to battle others” described a source of engagement that fitted into the conceptual category termed “Socializing”, since this category covered the activity of playing with others which could be triggered by competition, communities, communication, camaraderie, performing and cooperation.

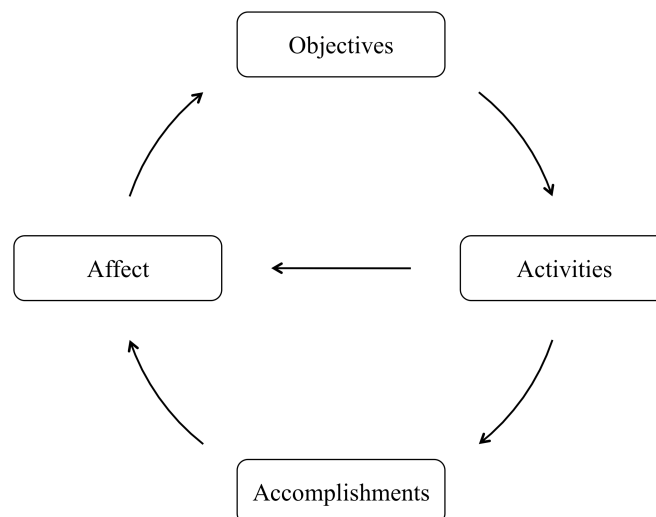
The conceptual categories were finally structured into four main components – Objectives, Activities, Accomplishments and Affects. Each of the components consequently consists of the conceptual categories, all of which support continuation desire and player engagement: Objectives – intrinsic or extrinsic; Activities – interfacing, socializing, solving, sensing, experiencing the story and characters, exploring, experimenting, creating and destroying; Accomplishment – achievement, completion and progression; and finally Affect – positive, negative and absorption.

## THE PLAYER ENGAGEMENT PROCESS

The analysis of the responses suggests that player engagement can be described as a process with the following characteristics and relations between the identified components:

- Players can become motivated to begin playing through either game-related motivations (e.g. a new, interesting game) or through personal motives (e.g. wanting to find new online friends).
- When a player then starts to play, either the game sets up an objective (e.g. to win a race) or the player makes up a self-defined objective (e.g. to visit all locations in a game world).
- The objectives trigger activities which the player performs (e.g. experimentation) in order to accomplish the objective (e.g. optimise a racing car).
- An engaged player can have the desire to continue performing activities as long as the objective is not reached, in order to experience accomplishment as a result of successfully performing the activity (e.g. completing a level through solving puzzles).
- Players can experience affect of some sort as the result of performing an activity (e.g. relaxation after moving the body in an “exergame”), through the accomplishment of an objective (e.g. satisfaction through achieving special equipment) or if the objective is not accomplished (e.g. frustration because of an unbalanced game).
- If the affect is experienced as positive, player engagement can be sustained and a new cycle can begin with new objectives or by returning to play the same game later.

The player engagement process (PEP) can be visualised through the Objectives, Activity, Accomplishment and Affect (OA3) framework depicted in Figure 1.



**Figure 1:** Relations between Objectives, Accomplishments, Activities and Affect.  
(The OA3 framework)

## THE CATEGORIES OF PLAYER ENGAGEMENT

In order to corroborate the components of the framework, as well as to identify any categories additional to those identified in the first survey, two extra data collection surveys were conducted. The second survey was concerned with another group of media technology and game design students (n=42), and in the third survey different types of respondent were recruited from various online game forums (gamespot.com, gamesforum.com and neoseeker.com; n=48). These extra surveys used two questions from the first investigation: “What in a game makes you want to continue playing?” and “What in a game does not make you want to continue playing?” They were conducted online, and basic demographic data about respondents were gathered as well. However, these data were not used in this study, as it is the intention to carry out a quantitative investigation of different target groups and games based on the identified components and categories of player engagement in future research. Focused coding was used to analyse the responses and no further components or categories were identified in the additional two surveys.

In the following, the characteristics of the four components and the corresponding categories of player engagement will be described. Examples of triggers which initiate player engagement in each category, as well as triggers of disengagement, will also be presented. All the identified triggers were derived from the answers from all three surveys, and sample representative answer statements are included to exemplify the findings. It should be noted, that the responses indicate that players can be engaged by different categories at the same time.

### Objectives

The objectives component is concerned with what a player wants and the game-related triggers that motivate the player to continue playing. The responses include several examples indicating that players are engaged through two distinct categories of objectives.

*Extrinsic* objectives are extrinsically motivated goals set up by the game, e.g. challenges, quests, collecting a certain amount of items or something that has to be overcome within a limited time scale.

*Intrinsic* objectives are intrinsically motivated, self-defined goals made up by the player, for example when a game includes elements which enable players to define their own objectives. One respondent explains that one way of gaining satisfaction when playing is “reaching a self-made goal, e.g. expanding a city to a certain size in SimCity”.

Each individual game sets up a variety of extrinsic objectives, and all players make up a multitude of intrinsic objectives. This diversity of objectives is illustrated when respondents state: “I want to...” followed by examples of various triggers: “... overcome a challenge”, “... beat someone”, “... hit something”, “... avoid everything”, “... finish building something”, etc.

The intrinsic and extrinsic objectives are thus the fundamental categories of player engagement, and the responses suggest that one reason for players’ desire to continue is that they want to keep playing until the objectives are accomplished, as stated here by one respondent: “A new goal to achieve, [gives] constant motivation”.

## **Activities**

The component of activities is concerned with what players *want to do* in order to reach an objective. The responses indicate that an activity can be performed in-game, out of the game and within the mind and/or with the body. The responses also illustrate that players perform various categories of activities as a means of accomplishing objectives.

### ***Solving***

The category of solving is describing activities, where players become engaged in using their mental faculties to solve intellectual challenges and puzzles, develop strategies, devise tactics and solve problems when they are motivated by intellectual challenges. As one respondent states: “[I get motivated when the game is] challenging my brain with puzzles”. Another respondent wants to keep playing when he is performing the activity: “Using my brain...” in order to reach his objective, namely “... to outsmart my opponent”. Respondents additionally mention that they become disengaged when puzzles are too hard or too easy or if the intellectual challenges are repetitive and trivial.

### ***Sensing***

Most games are mediated via both audio and visual (and in some cases haptic) elements. The category of sensory engagement makes players want to continue to play because they want to experience the audio (sounds, soundscapes and music), visuals (graphics and animated elements) and aesthetics as well as the atmosphere. Experiencing the audiovisual elements can be enough to keep players engaged, as one respondent states: “[I keep playing] to see every part of a visually and audibly compelling game [...]”. Badly designed or boring visuals, audio or settings, as well as an audiovisual interface that is not well designed, are elements which on the other hand can prompt respondents to stop playing.

### ***Interfacing***

The Interfacing category is concerned with the control of the game and the physical actions that players carry out in order to reach their objectives. This ranges from simple keyboard tapping to full body movement in “exergames” or “movement games” played through the Xbox 360 Kinect, the Playstation Move or the Nintendo Wii-mote systems. One example of player engagement through interfacing comes from a female respondent, who states that she keeps playing because she simply wants to move: “When I play Wii Fit and want to be active”. Player engagement through Interfacing can also be triggered by mimicking/replicating actions and also covers voice input and other input devices (e.g. in singing and band games). Respondents mention that they do not want to continue playing a game when the controls or the input interface are badly designed or when the control of the game is not easily accessible.

### ***Exploration***

When players are engaged in exploratory activities they are motivated by objectives concerned with exploring the game’s elements, the world and the setting, seeking variety, discovering novel elements in the game or encountering the unexpected. As one participant states: “[I am motivated by] the feeling that there are new experiences waiting for me on the horizon”. Players can become disengaged while exploring if they get stuck, when they *have* to find collectibles or when it takes too long time to get somewhere.

### ***Experimentation***

The possibilities of modifying a game, customising elements or characters or playing with the possibilities of the game mechanics can trigger players into engaging in

experimentation. They can, for example, experiment by playing different roles, use new tactics or try out different scenarios. As one respondent states: “In the game Minecraft [...] there is no story, no end, nothing else but experimenting [...]”.

### ***Creation***

When a game supports user-generated content and opportunities to build or create new elements, players can feel engaged to such an extent that they return to play purely because it challenges their desire for creation, as stated in this example: “[I want to come back to play because I am] creating my own levels for fun” (in *Little Big Planet*)”.

### ***Destruction***

Many recent games are focused on the destruction of structures and objects, while elimination and killing opponents are central to many games. These possibilities engage players to keep playing due to activities related to destruction. For example, as one respondent states, “Games that allow you to destroy things are very entertaining [...] A good example is *Just Cause 2*. You are able to destroy nearly everything in this game”. However, some respondents also become disengaged when there is not enough variation in the destructive activities, as stated by the same respondent here: “Most of the time, it’s very entertaining blowing everything you see up, but after a while the game begins to lack substance and the wish to play it decreases”.

### ***Experiencing the Story***

Another category of player engagement activities involves players experiencing the story while being motivated by objectives concerned with finding out how the storyline develops and progresses, how the plot thickens or what the different chapters contain. Examples of triggers for this type of engagement are the anticipation of what will happen and being curious about how the story evolves: “[I keep playing] because of the story and that I want to see what happens next”. Respondents’ answers differ a lot concerning the story, as some do not want to keep playing when there is too much story, if the story is boring or bad or if there is no story at all.

### ***Experiencing the Characters***

Some respondents also want to continue playing because they want to develop and play with their characters; they want to experience how their characters evolve, what happens to them, how to affect them and how they interact with the world and other characters. Players can become disengaged when they are not satisfied with characters in a game, for example when an unintelligent AI controls the characters.

### ***Socializing***

The category of social engagement involves the social activities of playing, i.e. when sharing the experience of playing with others becomes an objective in itself. Players who feel engaged while playing with others at home on a console that supports multiple players, or with friends online via Wi-Fi or LAN, report that they return to play because the game stimulates friendship, camaraderie and the social element. As one respondent puts it: “[I come back to play] if [I am] able to battle others”. Other players keep playing because they want to take part in game-related communities and cooperate in teams: “I like team-play, tactics and communities – often more than the actual game”. Performing well or helping someone can also engage players because these activities earn the respect of peers.

Communication between players may also motivate players to keep playing, for example when they compare their achievements, brag about their skills or desire to be better than

others are at playing the game: “[I keep playing when I am] getting closer to the goal of being in the top 100”. Chatting or writing about their experiences in the game or outside the game can also encourage continued play: “[I get satisfaction when] people are writing articles about you and your clan in some hot news [...]”.

Competing with others is an activity that is triggered by, for example, racing and fighting and is usually closely related to socializing where the results of a competition are compared. If there is too much competition in a multiplayer game, or when the competition is unbalanced, some respondents can also become frustrated and may choose to disengage. Some respondents do not even want to play a game when there is no multiplayer option.

### **Accomplishments**

The accomplishment component is concerned with what happens when an objective is accomplished and is related to the end results of players’ activities towards the objectives. The responses can be divided into categories of achievement, progression and completion.

#### ***Achievements***

Respondents answer that they keep playing when they want to achieve or get something – such as items, equipment special artefacts, points, access keys to new levels, unlocking special abilities, etc. For example, one respondent keeps playing when he has “the chance to achieve things and unlock new abilities/items”. If there are no achievements or payoffs to strive for in a game, some respondents state that they become disengaged.

#### ***Progression***

The category of progression includes the desire to get better equipment, advance to a higher level or improve abilities in general. One respondent wants to continue to play when he is “[...] getting better gear, completing tougher parts of the game [...]”. In addition, players will keep playing for as long as the game manages to keep them engaged by measuring advancement in terms of, for example, points, score, levels, stats, experience points, Xbox Gamerscore and/or Steam achievement points. Other triggers of progression are the desire to master a game to perfection, i.e. improving the ability to adapt to variations of the basic rules of the game and the process of learning the basic rules, patterns, possibilities and limitations: “[I want to come back to play because] the number of items and game mechanics were few but what you could do with them was plentiful. You could always be a bit more precise, faster, better positioned on the map, etc. (in Quake 3).”

When there is too much repetition, no variation, trivial and predictable elements and no progression, some respondents do not want to keep playing.

#### ***Completion***

Another accomplishment consists of game elements that motivate a player by setting up challenges, obstacles, encounters and similar objectives in order to get something done, complete something or finish it fully. This type of engagement is also caused by a player’s desire to overcome in-game, AI-controlled opponents such as end-level bosses and other entities or to compete against non-player characters. Players also choose to continue playing because they feel a need to complete tasks, quests, raids, levels and missions, overcome a challenge, avoid something, simply survive or complete a puzzle, solve a riddle or finish anything that can be accomplished.

Perseverance is an important trait for players engaged by the completion category: “As I am a perfectionist, it gives me great pleasure and satisfaction to achieve an optional goal. I always try to get a 100% killing rate of all enemy units, even though I only have to destroy their buildings, for instance”. Some players keep playing because they want closure, i.e. to explore all the challenges that the game world presents or to find answers to all questions: “[I come back to play when I have] a sense of not being finished, either due to a failure to explore the story or world fully, or having failed to defeat a particular challenge”. Generally speaking, players return to play as long as they are motivated to complete the challenges offered by the game, and as long as there are more interesting elements to complete. Respondents, on the other hand, become disengaged when the difficulty level of a given challenge is too high or too low a challenge, when there are no challenges to overcome or if there is no balance between challenges and skills. When there is nothing at stake, and if completing something is too hard, respondents also do not want to keep playing.

### **Affect**

The affect component is concerned with the emotions players experience when performing activities and/or accomplishing something.

#### ***Positive affect***

The positive affect is an important category of engagement, as the respondents included a variety of positive emotions in their responses: enjoyment, fulfillment, success, victorious, excitement, curiosity, anticipation, surprise, satisfaction, relaxation, relief, empathy, the feeling of fun (e.g. through humour), suspense, tension and excitement (e.g. in order to avoid boredom). Some players actively seek out game experiences that may result in arousal or specific physiological reactions, for example when they want to be relieved of stress or want to experience an adrenaline rush: “[A game gives me satisfaction when] getting out of impossible situations. Getting from A to B in lightning speed. Adrenalin gets me pumped [and] creates a warm feeling in my cheeks”. Empathetic reactions may also occur if a player develops feelings for in-game characters or starts to care about something in the game world: “[I get satisfied] when I feel that my character/role has made a difference [...]”.

#### ***Negative affect***

The respondents mentioned many sources of disengagement related to negative affect. If a game is uninteresting, boring, frustrating, dissatisfying, not logical, too simple, meaningless, annoying, unforgiving, wastes the player’s time, if it can be completed too quickly or is too time consuming and simply not fun, it may also result in disengagement. Furthermore games which do not appeal to the respondent, are too mainstream, the wrong genre, or create too much time pressure can make some respondents stop playing.

However, a negative affect can also become a trigger for sustained engagement, as in this example, where one respondent keeps playing even when becoming frustrated: “Sometimes [I] play casual puzzle games, and when it doesn’t work for me I get angry and play until I solve the puzzle”. Furthermore, even though a task can be boring and repetitive to accomplish (e.g. when “grinding”), a player might still be engaged due to the desire to continue in order to progress.

#### ***Absorption***

Feeling absorbed in a game is related to the concepts of flow, immersion and presence. Becoming immersed or experiencing presence is reported, for example, when a player



feels that she is in another place (mediated by the game) and wishes to go there again and again to escape from the real world: “[I am motivated to play when I can experience] completely different worlds that I can immerse into”. Another respondent experiences how engagement can lead to self-presence and is motivated by a desire to become so absorbed in the game that he “becomes” the main protagonist of the game: “[I want to keep playing] whenever you stop thinking it is a game that you are playing, and instead your mind and the game melt together. Like in God of War, you no longer play Kratos, but you become Kratos”. Some respondents mention that they might even become disengaged if there is a lack of immersion in the game.

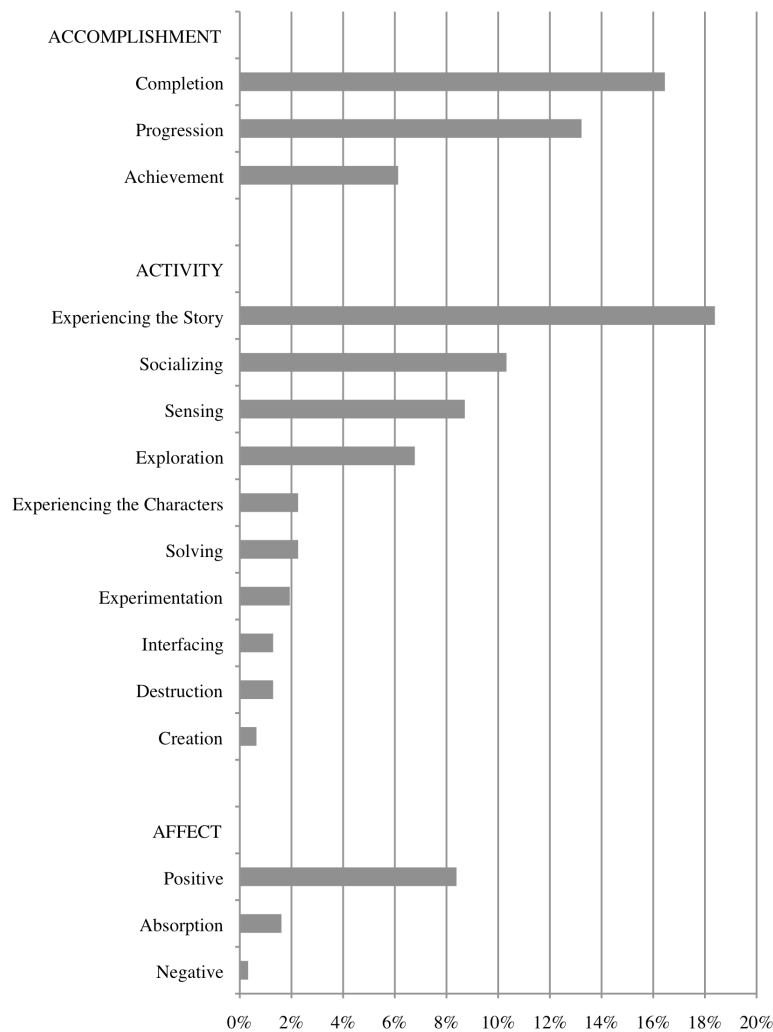
The responses indicate that all three categories of affect can become drivers of continuation desire, as some players want to keep playing due to the affect resulting from sustained activities or accomplishments of objectives. The experienced affect stimulates players to make up new, self-defined intrinsic objectives, to accomplish yet another game-defined extrinsic objective or to play again at a later time

This concludes the presentation of the various components and categories of engagement, which now can be compared by rank-ordering.

### **Rank-ordering the Categories of Engagement**

In order to exemplify one application of the framework, and to compare the categories of player engagement, all the responses from the open question “What in a game makes you want to continue playing?” in the three surveys (n=83, students; n=48, game forums) were divided into statements relating to each of the categories of player engagement concerned with the components of activities, accomplishments and affect. The objectives component was not included, as the question concerned with that component was only included in the first survey. All statements (n=310) were then organised into categories, counted and finally rank-ordered. Figure 2 shows how many times the respondents mentioned elements of the various categories in percentage terms.

Although this ranking obviously only gives an indication of the significance of the various categories among the random respondents selected for this study, it does demonstrate that accomplishment overall (36%), experiencing the story (18%), socializing (10%), sensing (9%), exploration (7%) and positive affect (8%) were the most often mentioned categories among this group of respondents.



**Figure 2.** Categories of player engagement rank-ordered; 131 Respondents, 310 Statements.  
What in a game makes you want to continue playing?

## DISCUSSION

The purposes of this study were to identify empirically the triggers, components and categories of player engagement and to use these findings to develop a framework of the player engagement process. The suggested framework attempts to explain how engaging player experiences are sustained and how the identified four components and categories of player engagement support the desire to continue playing.

## Limitations

One limitation of the findings in the current study is that it remains to be investigated whether the identified categories of player engagement are valid for other target groups and games. In an earlier investigation of engagement in World of Warcraft (WoW) (Blizzard Entertainment 2004), 419 players responded with 178 answers describing which elements in WoW “[...] engage you, i.e. make you want to continue to play and make you come back for more” (Shelepin 2010). Using focused coding on the relevant answers from that study, no new categories of player engagement were found, which

indicates that those identified in the current study also cover engagement experienced by WoW players.

An examination of other target groups (e.g. female, casual, hardcore or elderly players) and specific games could further validate the categories found in the current study. Additionally, an investigation among game designers into how they design games in order to make people keep playing could furthermore support the findings in the current study. However, the process-oriented framework of player engagement is designed for flexibility and each component could potentially be expanded with add-ons, should the presence of novel categories occur in new target groups or future games.

The exemplified rank-ordering of the categories shows that it is possible to get an indication of the importance of the different categories that make players want to continue to play. However, this is only true for the respondents asked in this study, and further investigations are needed in order to compare a range of target groups as well as game genres. Another limitation of the ranking in the current study is quantification through the interpretation of answers to open-ended questions that might be biased by the researcher, a problem which could be addressed by quantitative surveys using the categories identified in the current study.

### **Comparison with other studies**

Some of the findings share characteristics with other theories, for example the affect category labelled 'absorption', which is strongly related to the concepts of flow, immersion and presence. However, it can be argued that these concepts are insufficient in explaining the complex, multifaceted concept of engagement thoroughly, due to their focus on other player experience elements rather than the triggers of player engagement found in games.

According to the findings and the framework, concepts which are usually used in relation to describing engagement, e.g. immersion, presence, flow, pleasure, fun and enjoyment, are related to the affect component of the framework and are thus *results* of player engagement, indicating that continuation desire is a necessary prerequisite in order to experience these concepts. This is somewhat in line with Brown and Cairns' work (2004), as their findings suggest that engagement is a prerequisite for immersion. The current study also relates to this work inasmuch that to become engaged or engrossed, a player firstly needs to be motivated (by setting up an objective), and then time, effort, attention and emotion must be invested (by performing a range of activities) in order to continue playing (by setting up new objectives after experiencing accomplishment and/or affect).

In general, the player engagement process suggests that without any engagement it is harder or even impossible to experience some of the other concepts mentioned in the literature review such as flow, as also suggested by Jennet et al. (2008). However, even if it can be argued that player engagement might also support the three dimensions of presence (spatial, social and self-presence) mentioned by Tamborini and Skalski (2006), players could experience spatial presence without being engaged, for example when experiencing a realistic, yet uninspiring, virtual environment.

The framework also illustrates that activities can become rewarding in themselves when they result in positive affect. This relationship between activities and affect can be associated with the concept of autotelic activities mentioned in relation to flow by

Csikszentmihalyi (1991), which have a rewarding purpose in themselves and are undertaken purely for the enjoyment of doing so.

The component of affect identified in the current study obviously bears resemblance to the different dimensions of the player experience identified by Poels et al. (2007) and used by IJsselstein et al. (2008b) and Van den Hoogen et al. (2008) to investigate player experiences, because these are concerned with the player's experiences and feelings. However, they could all be argued to become results of engagement or disengagement, and so it would be interesting to add the element of continuation desire in future investigations in order to explore further the player engagement dimension.

The player engagement categories identified in the current study can also be related to other studies. Yee (2006) identifies players' motivations to play Massively-Multiplayer Online Role-Playing Games (MMORPG) and describes three components (achievement, social, and immersion) with ten subcomponents, which all support the player engagement categories. The sub-components of achievement (advancement, mechanics and competition) are related respectively to the categories of progression, solving intellectual problems and the competition aspect of socializing. The social component (socializing, relationship, teamwork) is associated with the category of social activities. Finally, the subcomponents of immersion (discovery, role-playing, customisation and escapism) are related to exploration activities, experiencing the story and characters and the affect of absorption/escapism. However, the player engagement framework includes additional categories (e.g. interfacing and creation) due to the wider range of games investigated. The categories also corroborate the findings from the works of Przybylski et al. (2010) and Rigby and Ryan (2011), as the social category is associated with the need for relatedness, while e.g. exploration, experimentation, creation, and intrinsic objectives are related to the need for autonomy and finally advancement, achievements and interfacing are connected to the need for competence.

The player engagement categories and components also relate to Ermi and Mäyrä's SCI model (2005) whereby sensory immersion can be explained as a result of the activity of being engaged by sensing the game. Challenge-based immersion is an outcome of being engaged by interfacing with the game, solving problems and advancement and completion. The overall suspense caused by uncertainty regarding the outcome (which also is related to challenge-based immersion) is an affect experienced by the player during the performance of activities. Finally, imaginative immersion is related to the activity categories of experiencing the story and the characters, as well as the affect component in the player engagement framework.

Furthermore the player engagement process also supports Klimmt's (2003) view that players start playing, continue to play and return to play because they want to experience enjoyment. Enjoyment (an affect) is the result of becoming engaged while playing and enjoyment is also one reason to become engaged, because the experience of enjoyment can lead to new objectives and activities which results in new enjoyable experiences. However, as can be seen in the findings in the current study, players also begin playing, keep playing and come back to play for additional reasons.

## CONCLUSION

This study has revealed that engagement can be explained as a process whereby players engage in a pursuit of *objectives* (intrinsic or extrinsic) and consequently perform a range of *activities* (interfacing, socializing, solving, sensing, experiencing the story and characters, exploring, experimenting, creating and destroying) in order to *accomplish* objectives (by achievement, progression and completion) and feel *affect* (positive, negative and absorption). Exploring the concept of player engagement by focusing on the continuation desire has been beneficial, and the results show that a number of categories need to be included when investigating the concept. The method proved to be advantageous in investigating the many aspects of engagement, and resulted in new knowledge and a more detailed understanding of the aspect of continuation desire – an understanding that hopefully can inspire future discussions and research on player engagement. The framework proposed in this study, along with the various categories of player engagement, thus lay out the foundation for future work and are intended to be utilised by game developers in designing for engagement, develop new ways of mapping and evaluating player engagement during game play (e.g. Schoenau-Fog 2011), assist scholars in analysing and categorising player engagement in games, as well as inspire the design of novel engaging interactive experiences and learning applications.

## ACKNOWLEDGMENTS

The author would like to thank students at the Departments of Architecture, Design and Media Technology at Copenhagen and Aalborg campuses for their interest while answering the questionnaires and for their enthusiasm when discussing the many facets of their experiences with engagement and games. Thanks also go to Jan Shelepin for the extra survey data and to Morten and Peter Schønau Fog for many valuable discussions. Finally, the author expresses his gratitude to those reviewers whose comments and feedback helped to improve this paper.

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# Paper II

## Hooked! Evaluating Engagement as Continuation Desire in Interactive Narratives.

*Conference proceedings paper  
(Best student paper award)*

*Presented at The Fourth International Conference on Interactive Digital Storytelling,  
Vancouver, November, 2011.*

Schoenau-Fog, H. (2011). Hooked! Evaluating Engagement as Continuation Desire in Interactive Narratives. In: Si, M., Thue, D., André, E., Lester, J., Tanenbaum, J., Zammito, V. (eds.) Interactive Storytelling. 4th International Conference on Interactive Digital Storytelling, ICIDS 2011, Vancouver, Canada, November 28-1 December, 2011, Proceedings. LNCS, vol. 7069. pp. 219–230. Springer, Heidelberg.



# **Hooked!**

## **– Evaluating Engagement as Continuation Desire in Interactive Narratives**

Henrik Schoenau-Fog

Department of Architecture, Design and Media Technology,  
Section of Medialogy, Aalborg University, Copenhagen,  
Lautrupvang 15, 2750 Ballerup, Denmark  
hsf@create.aau.dk

**Abstract.** Engagement in interactive experiences is a complex, multi-dimensional concept that can be determined by a variety of factors which are dependent on user preferences and media content. However, one fundamental requirement of any interactive experience is the desire to continue the experience, and this study is concerned with investigating engagement in interactive narratives by focusing on this aspect. In the present approach, engagement is described as the user's desire to continue an activity in order to accomplish an objective while experiencing affect. In order to investigate engagement during run time, this description is used as a foundation for formulating an intrusive method and the Engagement Sampling Questionnaire. The application of the method and the questionnaire is exemplified by an investigation of continuation desire in the experiential learning scenario, "The First Person Victim", where participants experience a non-pleasant emergent narrative concerned with being a victim of war.

**Keywords:** Engagement, Continuation Desire, Measurement, Evaluation, Interactive Narrative, Emergent, Questionnaire, Game, War Victim.

## **1 Introduction**

"I want to continue... Now...!" – This user feedback might very well be one of the utterances every game designer or interactive experience developer hopes for when their application is paused during run time. In the area of interactive storytelling this also holds true, and as more interactive storytelling applications are being developed, there is a greater demand for acquiring knowledge about the user experience in interactive narratives [1].

In the related field of game and play studies, several investigations have focused on identifying the various dimensions and aspects of the player experience – both theoretically, e.g. [2], and empirically, e.g. [3]. Engagement is one key facet of interactive experiences, and due to its multi-dimensionality the concept can be related to various other concepts such as Immersion, e.g. [4], Flow [2, 5], Presence (as psychological immersion) [6], Enjoyment [7, 8], Motivation, e.g. [9], and Fun [10, 11]. There are thus a number of diverse explications of how engagement relates to

these concepts, and there is a difference in how the term is understood and used when investigating player experiences.

Findings from [12] suggest that engagement can be described as a process whereby players dedicate themselves to performing activities in order to accomplish objectives set up either by the application or the player. While performing activities or when accomplishing objectives, players can experience feelings of positive or negative affect as well as the aforementioned concepts. Engaged users are also motivated to begin an experience, they want to continue experiencing and they want to try again. One could consequently argue that engagement is a prerequisite for experiencing fun, enjoyment, pleasure, flow and immersion because players need to become engaged before these other concepts can be experienced (see also [4]). Furthermore, in [13], one fundamental element of the concept of play is described as the willingness to continue playing, and this ‘continuation desire’ is driven by pleasure emanating from the experience of play itself. The desire or willingness to continue an experience can therefore be argued to be a necessity for engagement and thus a fundamental aspect of any interactive experience investigation.

Different methods can be useful for acquiring knowledge about the elements of an interactive storytelling application that make the user want to continue, as well as to which degree he or she wants to continue. However, investigating the various concepts that have traditionally been associated with engagement is a well-known problem, especially when dealing with the concepts of immersion, presence and flow, which are all challenging to measure and can ‘break’ if they are investigated by interrupting the player with a self-report survey during the experience. These investigations are thus often based on post-experience questionnaires [e.g. 14]. Nevertheless, it can be argued that since the willingness to continue will remain, even if a user is interrupted, it would be possible to investigate his or her desire to continue during run time by pausing the experience and administering a self-report survey.

In the following sections, examples of player experience studies related to engagement in games will be reviewed in order to form a foundation for the development of an intrusive method and a survey instrument – The Engagement Sample Questionnaire – which aims at exploring and assessing the aspect of continuation desire in interactive narratives.

## **2 Investigating Player Experiences and Engagement in Games**

In [14], engagement is described as a term which is “used as a generic indicator of game involvement” [14, p. 624]. The authors present the Game Engagement Questionnaire (GEQ) with 19 questions, intended to measure the subjective experience of deep engagement, which according to the authors is a construct related to immersion, presence, flow and absorption. The GEQ is not intended to investigate the triggers of engagement or the willingness to continue in-game; rather, the self-report post-game questions “I feel like I just can’t stop playing” (related to flow in that study) and “I play longer than I mean to” [14, p. 627] (associated with presence in that study) point somewhat to the continuation desire aspect of engagement.

A research group working on The Fun in Gaming (FUGA) project [7] developed and validated the self-report Game Experience Questionnaire (GEQ) [15]. This questionnaire is intended to investigate player experience through seven different dimensions: sensory and imaginative immersion, tension, competence, flow, negative affect, positive affect and challenge. These dimensions have been identified through focus group explorations and the theoretical analysis of accounts of player experiences [3]. However, none of the 14 questions in the iGEQ in-game version of the GEQ is concerned specifically with indicating how much the players want to continue playing. Additionally, none of the 17 questions from the post-game module focuses on how much a player wants to try to play again. As there is a question related to boredom – “I felt bored” [15, p. 6] – it can be argued that the questionnaire takes into account the opposite concept of engagement. However, even if a task can be boring to accomplish – such as the concept of ‘grinding’ – a player might still be engaged because he or she wants to continue in order to advance.

In the games industry, pausing the game and asking questions is becoming an industry standard approach. In [16, 17] the TRUE (Tracking Real-Time User Experience) instrumentation is concerned with the automated collection of gameplay feedback, which is useful for the design team to understand the player experience during the entire exposure to the game. In order to support the information gathered via the contextual data, what players do in the game and player behaviour, the TRUE method also collects attitudinal data about opinions and feelings through in-game surveys and pop-up questions. Although the TRUE method can map self-reported enjoyment over time via time-based surveys, and users can indicate if they feel bored in on-demand surveys, it appears that there is no mention of investigating how much the player wants to continue playing in the cases presented in [16, 17].

In another study [10], an initial experience playtest focuses on in-game components such as players’ ability to take control over their characters, while experiencing satisfaction and being motivated to continue playing. This playtest is conducted by asking participants to stop playing after each mission and report their experience of the excitement, fun and clarity of the objectives. In extended playtests, which run for more than two hours and gather attitudinal data, participants are asked to provide feedback about a specific point of time in the game or at experience intervals (e.g. after a mission). This procedure and the TRUE approach are very similar to what is needed in the current study and can be used as an inspiration for developing the intrusive method as a means of investigating continuation desire and engagement in interactive narratives.

### **3 Evaluating Continuation Desire in Interactive Narratives**

The Engagement Sample Questionnaire (ESQ) and the intrusive approach are based on the Player Engagement Process (PEP) [12] combined with inspiration from findings in the above review and Csikszentmihalyi’s work with the Experience Sampling Method [18]. The idea with the intrusion method is that even if the application is paused the assumption is that users will still want to continue the experience and be able to a) indicate how much they want to keep on going and b)

reflect on why they want to continue in more detail. The questions in the ESQ are organised according to the following components and categories found in the PEP framework [12]:

- 1) *Objectives*, which are either set up by the experience (extrinsic objectives) or by the user (intrinsic objectives)
- 2) *Activities*, performed in order to accomplish the objective (e.g. interfacing, socialising, solving, sensing, experiencing the story and characters, exploring, experimenting, creating or destroying)
- 3) *Accomplishment* of an objective (by advancement, achievement or completion)
- 4) *Affect*, experienced while engaged users perform an activity or accomplish an objective (positive: e.g. enjoyment and pleasure; negative: e.g. frustration and boredom; and absorption: e.g. flow and immersion)

The first part of the ESQ includes questions concerned with the respondent's demographics (gender, age, frequency and amount of playing, favourite game and genre, etc). The second part focuses on the pre-experience motivation to begin the experience by investigating how much respondents want to begin and what motivates them to start the application (their objectives). The third part is repeated at various points during run time, whereby quantitative application run time data can also be gathered before and after the intrusion (e.g. which event the user has just experienced and which activities the user performs before and after the interruption). At these points the user should answer a series of questions addressing the desire to continue playing: a quantitative question assessing how much he or she wants to continue the experience (captured by a seven-point Likert scale) and open-ended questions concerning what makes them want/not want to continue (their objective), what they are doing in order to reach their objective (the activities) and what they feel/experience (affect). Finally, a question stating, "What is happening (in the application)?" is included in order to capture information concerning the generation of the user's own (emergent) narrative. The fourth and final part of the ESQ focuses on the post-experience willingness to want to try the application again, as well as what it is that makes the respondent want/not want to start again (their objectives) and other aspects related to the end of the experience.

Ideally the survey should be an integrated part of the application, so that questions are presented automatically at various predefined pauses in the game. An example of the use of the ESQ, accompanied by the exact wording of the questions, is presented in Table 1 in the following case study.

#### 4 Case Study: Engagement in 'The First Person Victim'

In order to exemplify the usage of the ESQ and the intrusive method, a playable prototype of the experiential learning scenario 'The First Person Victim' (FPV) [19] will be investigated. This application is chosen in order to explore continuation desire in an interactive emergent narrative, where the objective is to communicate a range of negative feelings associated with being a victim of war. These feelings and the users'

experiences are intended to support in-class discussions on various issues related to war victims and refugees [20]. The theme is communicated through the use of tragedy and the first person shooter form, and turns the roles around by letting each user enact the experience of being an unarmed civilian and to encounter a realistic war scenario while being confronted with ethical issues. An ‘Interactive Drama Experience Manager’ [19] organises 42 possible events, which vary in tension in six scenes. The user’s narrative construction depends on their encounter with these events, and each event is mediated in the form of text, audio, visuals or video recordings of actors integrated into a 3D environment and implemented with the game-engine Unity [21].

#### 1.4.1 Participants and Procedure

A total of 22 media technology and game university students and staff participated in the pilot test. Eighteen were male (82%) and four female (18%). Ages ranged from 20 to 56 years, with the average age being 27.5 years, and the average amount of hours of playing games per week ranged from 1 to 35 hours, with an average for all respondents of 9.6 hours per week. One test was conducted in labs (11 participants) and another evaluation took place at the respondents’ homes (11 participants).

**Table 1.** The Engagement Sample Questionnaire.

<b>ESQ Part One: Demographics</b> (gender, age, frequency and amount of playing, favourite game / genre)							
<b>ESQ Part Two: Before the experience</b>							
Q1. Please indicate below the extent to which you agree or disagree with this sentence: “I want to begin the experience” (to quantify the users Continuation Desire (CD))							
Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly	Other
Q2. “What makes you want/not want to begin?” (to identify the user’s CD and objective)							
<b>ESQ Part Three: During the experience</b>							
Q3. Please write the code which is written on the screen in the application: (identifying the latest event)							
Q4. Please indicate the extent to which you agree or disagree with this sentence: “I want to continue the experience now!” (Response options as in Q1)							
Q4. “What makes you want/not want to continue?” (to identify the source of the user’s CD and objective)							
Q5. “What do you feel now?” (to indicate the user’s affect)							
Q6. “What is happening in the experience?” (to explore the narrative generated by the user)							
Q7. “What do you want to do next?” (to identify the user’s activity)							
Q8. “General comments concerning the experience so far” (technical, content)							
Q9. “Do you want to continue?” (yes/no) (“yes” resumes, “no” directs to the final part of the ESQ)							
<b>ESQ Part Four: After the experience</b>							
Q10. Please write the code which is written on the screen in the application: (identifying the latest event)							
Q11. Please indicate the extent to which you agree or disagree with this sentence: “I want to try again!” (Response options as in Q1)							
Q12. “What makes you want/not want to try again (in the application / experience)?”							
Q13. “What do you feel now?” (to indicate the user’s affect)							
Q14. “What did you just experience?” (to explore the narrative generated by the user)							
Q15. “Why do you want/not want to try again?”							
Q16. “General comments concerning the experience” (technical, content)							
Q17. “How many minutes do you think you have spent in the experience?”							
Q18. Extra questions related to communication of the theme and learning outcomes, not used in this study							

The respondents in the labs participated in an in-class discussion with the author after the test, while respondents partaking at home conducted the test alone without debriefing. In both evaluations, respondents were asked to download the FPV and fill out the first two parts of the online ESQ (Table 1) before commencing the experience.

They were then asked to explore the environment until one of the first events was encountered, for example a friend calling to tell about how her neighbourhood was hit by a bomb and where to meet her. After each event, the application was automatically paused and the respondents were instructed to switch to the online questionnaire and respond with a code that indicated the scene and event they just encountered and then answer the remaining questions in the third part of the ESQ. The final part of the questionnaire occurred after the last event and inquired about the desire to try again.

## 2.4.2 Results

The 16 respondents who answered the question about the perceived time spent in the experience (not a mandatory question) reported that they used an average of 31 minutes on the experience (range: 8-100 minutes).

Of the total 22 participants, eleven (50%) went all the way through the experience. Four of those (36%) wanted to try the experience again, mainly because they wanted to try out different choices and possibilities. Out of the seven (64%) who did not want to try again, four (57.1%) thought the application had too many technical difficulties, two (28.6%) stated that it was due to no progression and boredom and one (14.3%) did not want to try again, because of feeling helpless in the experience.

Eleven respondents (50%) quit the application for different reasons: five (45.4%) experienced technical issues or became stuck, three (27.3 %) thought it was boring due to lack of progression, one was frustrated (9.1%), one was confused (9.1%) and one (9.1%) became dizzy and had to take a break. However, four (36.4%) of these respondents wanted to try again: one (25%) wanted to explore the environment more, one (25%) wanted to experience something new, one (25%) wanted to learn more about the situation and one (25%) was curious to experience more of the story. Of the seven who did not want to try again, three (42.8 %) reported that it was boring, two (28.6%) answered that it was due to technical issues, one (14.3 %) stated that it was hard to understand anything and finally one (14.3 %) did not give any reason.

Overall, eight (36.4 %) wanted to try the experience again, while five (22.7%) out of the total number of participants did not want to try again due to technical problems in the prototype.

**Activities, Accomplishments and Objectives.** The answers concerned with objectives, activities and accomplishments from all respondents were analysed by simple coding and organised according to the components of the PEP framework (Table 2). A wide range of individual intrinsic objectives and application-defined extrinsic objectives drove the respondents forward throughout the experience. The main activities were related to exploring the environment and experiencing the story and characters, as well as experimenting with other endings and the application itself. The objectives were accomplished by completion (e.g. finding an exit) or advancing (e.g. in the story).

**Table 2.** Reported Activities, Accomplishments and Objectives.

Activities	Accomplishments	Intrinsic Objectives	Extrinsic Objectives
Explore the environment (Navigate)	Completion	Find cues, information, people, exits or novelties. Help other civilians. Explore the whole environment. Try other ways to proceed. Get to safety, escape or flee. Get in and out of rooms and buildings or get out of the city. Survive.	Find the friend at the shop (after phone call event 'A5'). Avoid being shot by soldiers (after shooting event 'E3'). Get away from helicopter (after chopper attack event 'C5').
Experience the story and characters	Advancement Completion	Experience what is going on. Experience what happens next. See how it is going to end.	None.
Experiment	Completion	Experiment with the application. Try to find other endings.	None.

**Affect.** Respondents also encountered a range of different feelings (see Table 3) and reported having experienced a negative affect due to the grave theme and tragic narrative. Some of the accounts referred to technical problems and others were related to the narrative, content and theme. However, there were also examples of positive affect, amongst which were curiosity, suspense and feeling captivated by the setting.

**Table 3.** Reported Affect.

Positive affect	Curious, in suspense, intrigued, interested, startled, relaxed/relieved (after the experiences), enthralled/engaged, captivated by the setting.
No affect	Indifferent.
Negative affect-Technical related	Confused, lost, annoyed, frustrated (controls).
Negative affect-Narrative related	Agitate, nervous, excited and anxious, tense, wired, shocked, dizzy, fearful, worried, frustrated (cannot help others), powerless, angry, miserable, sick, desolated, bored, empty, frightened, scared, paranoid.

**Continuation Desire.** In order to exemplify the method of indicating a user's level of continuation desire, three representative respondents with major differences in their experiences have been selected to illustrate the variations.

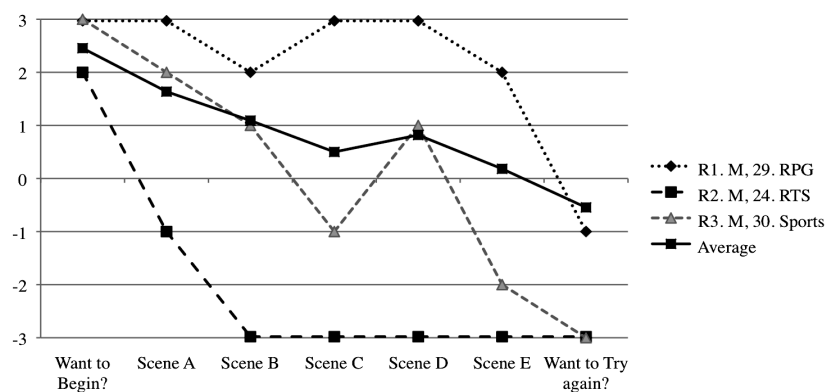
**Fig. 1.** Continuation desire levels.

Fig. 1 depicts individual continuation desire levels reported by the three users. An average based on the 11 respondents who did not halt the application before the end is also included. The number ‘3’ indicates “Agree strongly”, ‘0’ signifies “Neither agree nor disagree” and ‘-3’ means “Disagree strongly”. Table 4 shows their reported willingness to continue and the corresponding explanations. The questions were asked before the experience, after events during run time in scenes A-E and after the last event at the end of the experience.

**Table 4.** Sample continuation desire responses

<p><b>R1:</b> Male, 29. Genres: Role-play, Adventure and Strategy. Favourite game: “Fallout 1”</p> <p>Do you want to begin? Strongly agree. “Sounds like an interesting concept”.</p> <p>Do you want to continue? Scene A: Strongly agree. “I’m curious about what happens next”.</p> <p>B: Agree moderately. “I still want to continue, but I would like to be able to interact with objects. Also, I don’t have any idea about where I’m going. I feel I’m running around aimlessly”.</p> <p>C: Strongly agree. “Now there are more things happening, and I feel that it actually matters what I do. I like what happens when you get shot”.</p> <p>D: Strongly agree. “I got captivated by the setting”.</p> <p>E: Agree moderately. “It seems like there are no other places to go. I might go and hike in the mountains, though”.</p> <p>Do you want to try again?: Disagree a little: “I feel that I explored everything I could”.</p>
<p><b>R2:</b> Male, 24. Genres: Real-time Strategy, Action, FPS, Puzzle, Quiz. Favourite game: “Starcraft 2”</p> <p>Do you want to begin? Agree moderately. “I’m interested in what the game is about and how it looks”.</p> <p>Do you want to continue? Scene A. Disagree a little: “Low mouse sensitivity, boring graphics”.</p> <p>B: Disagree strongly. “Weird dialogue and glitchy game elements”.</p> <p>C to E: Disagree strongly. “Same reasons as before”.</p> <p>Do you want to try again? Disagree strongly. “As mentioned, it was boring and very unfinished. The lack of other persons and realism made everything very dull”.</p>
<p><b>R3:</b> Male, 30. Genres: Sports, Adventure. Favourite game: “FIFA 2010”</p> <p>Do you want to begin? Strongly agree. “I am interested!”</p> <p>Do you want to continue? Scene A: Agree moderately. “I don’t know what is going on”.</p> <p>B: Agree a little: “I still don’t know what is going on yet. I want to figure it out”.</p> <p>C: Disagree a little. “The experience of seeing the person in the car die was tough. I could not help him and lost control. I am confused whether to rescue myself or help others. I am not sure what I can do..”.</p> <p>D: Agree a little. “I want to call someone and figure out what is going on”.</p> <p>E: Disagree moderately. “The woman was shouting for help but I could not help her. That feels horrible..”.</p> <p>Do you want to try again? Disagree strongly. “This is quite a horrible experience”.</p>

### 3.4.3 Findings

The results are intended to exemplify information which can be acquired through the intrusive method and the ESQ, and as this study was administered as a prototype pilot test with a limited amount of respondents it was not the intention to present statistically significant findings (e.g. related to gender, frequency/amount of play or favourite game/genre). Nevertheless, some indications are worth noting.

With the possibility of encountering six scenes, each consisting of seven potential events, users can construct very different emergent narratives. As expected, the acquired data thus contains a great variety of individual accounts reporting what is happening as well as inferences about the causes of experienced events, speculation about future events and a diversity of intrinsic objectives (see Tables 2 and 4).

The three respondents’ answers (Table 4) and corresponding self-reported levels of continuation desire (Fig. 1) also show differences. The real-time strategy user (R2)



quickly lost interest in continuing and instead focused on technical glitches and the lack of realism. The sports games user (R3) was very emotionally involved and did not want to try again because he was unable to help a woman who was harassed; in fact, he concluded “this is quite a horrible experience”. The role-play user (R1) had a generally high desire to continue, with a drop at scene B, followed by a rise at scene C because “Now there are more things happening”. However, this respondent did not want to try again because “I explored everything I could”.

The average continuation desire level of the 11 participants who completed the experience is also shown in Fig. 1. However, this result can only be seen as an indication of how the general level of continuation desire develops in the FPV experience, both due of the diversity of the events encountered and because four of the respondents did not want to try again due to technical difficulties, which obviously had an effect on their willingness to continue.

## 5 Discussion

Although it is not new to conduct in-game investigations of user experiences, there has been limited documentation in the literature concerning the investigation of engagement as continuation desire in interactive narratives through run time self-report surveys – as proposed in this study.

When evaluating interactive storytelling applications such as ‘The First Person Victim’, which is intended to communicate serious topics and initiate discussions based on a variety of user experiences, it is also imperative to investigate how users can be motivated to continue despite the tragic content. The intrusive method and ESQ can address this issue by investigating whether users still want to continue due to aspects other than enjoyment, fun, flow, pleasure and similar ‘positive’ facets of engagement. Therefore, it can be beneficial also to include investigations of continuation desire in order to supplement other methods such as game inquiries with the iGEQ [15] or [8], which evaluates interactive narratives.

Findings in the current study furthermore support the measurement scales from [8], where five key prerequisites of meaningful user experiences in interactive stories are presented: system usability, correspondence of system capabilities with user expectations, presence, character believability and effectance. As evidenced in the results, some users mention that they stopped the experience due to technical and system usability problems. Responses moreover support the prerequisites concerned with user expectations about system capabilities (especially those who play a great deal) and character believability (e.g. the actors on video textures seemed out of place to some users who were used to 3D animated characters). Presence as ‘being in the world’ was also mentioned, as some respondents reported that they were affected by the audiovisuals to a degree where they became dizzy or felt lost in the desolation of the virtual environment. Furthermore, there are also examples of respondents who wanted more effectance by stating that the application could have additional interaction possibilities than mere navigation (many wanted to have a gun, which is intentionally not possible. See [20] for more about these intended design choices). Finally, the affect responses shown in Table 3 support three of the five types of user responses in [8] that

represent the ‘typical’ common patterns expected to take place in different interactive storytelling systems, namely curiosity about what will happen next, suspense and aesthetic pleasantness (reported as “captivated by the setting”). There are no accounts of the responses in [8] concerned with flow and only a few responses related to enjoyment, which is possibly due to the intrusive method of inquiry and the tragic theme. However, accounts of negative affect are plentiful, and in the case of the FPV any reported negative affect related to the narrative and theme are actually signs of successful communication, for example when the sports games user (R3) feels horrible because it is impossible to help others.

When comparing the method proposed in this study with in-game, think-aloud and observational approaches, it is an advantage that it is possible to conduct surveys in respondents’ homes with no interference from the researcher. There is also no need to transcribe qualitative data due to the online survey technique, although it can be a time consuming challenge for respondents to answer five open-ended questions after each event. One way to address this issue and acquire quantitative data (while saving time and avoiding bias when analysing answers) could be to add standard choices in the questions related to objectives, activities, accomplishments and affect. These questions should still offer the choice to respond “other” in order to give the respondents an option for reporting qualitative answers.

It remains to be verified whether the subjective self-report survey indication of continuation desire is reliable and accurate. The ESQ could therefore be combined with other methods such as observations, run time think-aloud interviews, questionnaires (e.g. related to enjoyment, flow and immersion) or possibly psychophysiological measures, e.g. [22, 23], in order to supplement the current approach.

Furthermore, ESQ metrics could be expanded upon and refined in future work by correlating continuation desire ratings with additional run time data such as events and application-defined objectives, as well as captured user activities and accomplishments. Establishing these relations may help form new theories about engagement and the willingness to continue, and perhaps even make it possible to predict the level of continuation desire of interactive applications based on the nature of the run time events.

## 11 Conclusion

In this study the Player Engagement Process framework and in-game evaluation methods were combined to develop the Engagement Sample Questionnaire and an intrusive method of inquiry with online surveys, in order to evaluate continuation desire as an aspect of engagement in interactive narratives.

Results from the case study demonstrate that there is a wealth of information about a user’s willingness to continue, which can be gathered during run time, and that the ESQ and intrusive method can be used to investigate and quantify a user’s desire to continue. Information acquired with the ESQ is also valuable in evaluating the communication potential of interactive narrative experiences.

The findings indicate that even with the non-pleasurable content in the FPV, users become engaged because they want to continue exploring the environment,

experience the story and characters and experiment with the application and alternative endings. If the inquiry had been concerned with investigating other concepts traditionally related to engagement, such as enjoyment, fun, flow and immersion, some of this information might not have been gathered.

The ESQ method may prove valuable for both game and interactive experience designers, as continuation desire can be a fundamental indicator for engagement and a successful user or player experience. Feedback from run time investigations of continuation desire, investigating in detail users' objectives, activities, accomplishments and affect, can additionally assist in generating process-oriented data on what users dislike or value in an interactive experience. This information can then be used to redesign environments and arrange events in order to improve an experience or to create novel interactive concepts, because no matter what kind of interactive narrative with serious content or any other interactive experience designers create, one of the key concerns will always be: how do you keep users hooked?

**Acknowledgments.** Thanks for great teamwork while developing the FPV go to Faysal Fuad Khalil and Jawid Faizi, both M.Sc., as well as Luis Emilio Bruni, associate professor – all at Medialogy, Department of Architecture, Design and Media Technology, Aalborg University, Copenhagen. Credits also go to test participants from Medialogy and to researchers and students from the GAMBIT lab at MIT, as well as the anonymous reviewers whose feedback helped improve this paper.

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# Paper III

## Authoring for Engagement in Plot-Based Interactive Dramatic Experiences for Learning.

*Journal paper*  
(Accepted for publication)

Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2012). Authoring for Engagement in Plot-Based Interactive Dramatic Experiences for Learning. In: Transactions on Edutainment IX. ISSN: Springer, Heidelberg. ISSN: 1867-7207

# Authoring for Engagement in Plot-Based Interactive Dramatic Experiences for Learning

Henrik Schoenau-Fog, Luis Emilio Bruni,  
Faysal Fuad Khalil and Jawid Faizi

Department of Architecture, Design and Media Technology,  
Section of Medialogy, Aalborg University, Copenhagen,  
A.C. Meyers Vænge 15, 2450 Copenhagen, Denmark  
{hsf, leb, fkha06, jafa06}@create.aau.dk

**Abstract.** When developing interactive storytelling applications, most authors have to choose between providing the interacting subjects with either a pre-determined and plot-based narrative structure or a loose arrangement of events, which maintains the freedom of interactivity while sacrificing the author's control over communicating a theme. To address this problem, this paper contributes a method for organizing narrative events in a free-roaming virtual environment. The Interactive Dramatic Experience Model (IDEM) retains the freedom of navigation while maintaining the possibility to construct various coherent narratives that enable the theme to be communicated. This may be of particular relevance when using digital, interactive, and representational technologies in the mediation of ethically relevant and socially responsible themes. In order to explore the use of the IDEM, we have developed and evaluated the "First Person Victim" application. This interactive experiential storytelling scenario is intended as a tool for teaching about the negative consequences of war.

**Keywords:** Edutainment, Authoring, Interactive Storytelling, Drama, The Flying Wedge, Engagement, Emergent and Embedded Narrative.

## 1 Introduction

In certain circumstances the author/designer of an interactive storytelling application may intend to allow maximum freedom of interpretation into unforeseeable new narratives. However, this is not the case for interactive storytelling scenarios that are concerned with communicating ethically relevant and socially responsible themes. This is particularly evident in applications intended for learning, where the challenges are to maximize the interacting subject's freedom of navigation while maintaining a threshold of narrative closure and reception of the main theme intended by the author of the application.

In this paper we will describe our attempt to develop an interactive experiential storytelling scenario, which supports the participant's engagement during the experience and also incentivizes post-experience follow-up discussions. By enabling

each participant to experience an individual version of a narrative concerned with a particular didactic or normative topic, we give them the chance to discuss the theme from different points of view. For example, in a classroom setting the intention would be to provide students with individual, customized experiences which would then foster and support in-class discussions e.g. [1]. It is thus important that the application can trigger a variety of story-constructions among students, while maintaining the freedom of navigation, the coherence of the causality between events, and effectiveness in the communication of the theme.

In order to design and author an experience that offers the potential for multiple individual story generations, it is also necessary to address the challenges of the combinatorial explosion [2] by founding the experience on a limited amount of encounters and events. It is thus essential for the author to organize events in a way that gives the interacting subject the sensation of confronting indefinite possible outcomes in a free-roaming virtual environment, which in reality are based on a limited amount of events.

This problem leads to a range of questions, which are subsequently addressed in this paper: How can such an experience be planned by an author? How can events and encounters be organized and structured? How can a sense of coherent causality be maintained? How can one ensure that the theme is effectively communicated? And, finally, how can engagement be sustained in such experiences?

At this point it is relevant to qualify the terms “author” and “authoring” as used in this context. Customarily, in the field of digital interactive applications, the roles of designer and author are conflated. Authoring therefore includes mainly the general tasks of a designer, without paying particular attention to the thesis or the substance of the content being mediated. Whereas this may be the case in purely entertainment applications, it may sometimes be problematic in the context of edutainment and serious games that deal with didactic or normative content. In these cases, the authoring part of the equation should be more concerned with assuming responsibility for the content.

## **2 Drama and Narrative Structures**

In order to address the questions mentioned earlier, we begin by stressing the importance of dramaturgy. When working with edutainment by using interactive storytelling as a tool for teaching, dramaturgy may be used as a central element in the creative process. Drama has been used as a tool for human intellectual and emotional development since the times of the ancient Greek philosophers, for whom the cathartic effects of tragedy, for example, played an important role in the moral and ethical development of society in order to encourage justice [3]. Additionally, dramaturgy has also been considered as a prerequisite in the authoring and design of modern interactive storytelling applications [4].

Through this project we will thus attempt to use dramaturgy and interactive storytelling in order to create an interactive dramatic experience intended as a tool for mediating serious issues in classroom settings.

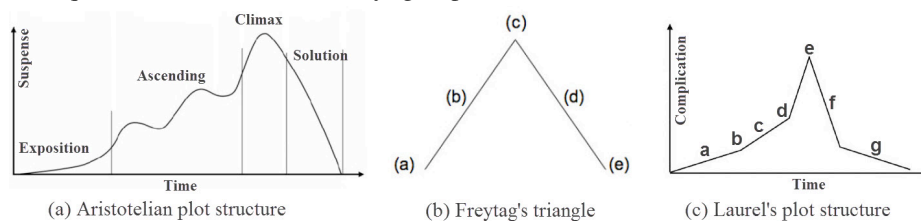
However, an author's construction of dramatic tension, which is determined by the causal relationship between the chains of events, may conflict with the navigational freedom of an interacting subject. In general, this relationship between authorship and interactivity is seen as being inversely proportional, and the problem of having a free-roaming interactive world and an author-controlled narrative at the same time is often termed as the "Narrative Paradox" [5,6,7,8].

Various plot-based linear and interactive narrative structures have been used for inspiration by various scholars as attempts to overcome the challenge of the narrative paradox. In the following subsections, some common structures will be described in order to assess their potentiality for creating interactive and dramatic experiences.

## 2.1 Linear Structures

Linear narrative structures imply the predetermination of a sequence of events by the author, where she is fully in charge of not only choosing the theme to be conveyed but also the sequential order of its deliverance. Hence, a reader in this case obviously has a fairly passive role, without being able to act and affect the story.

Fig. 1 illustrates three common ways of describing this linearity and the important milestones in the development of the plot. In Fig. 1a, the Aristotelian model of linear stories is shown, indicating where the storyline comprises four major periods: exposition, ascending storyline, climax, and dissolution [9]. Fig. 1b shows Freytag's dramatic triangle or pyramid, where the dramatic tension rises from the introduction to climax and falls to catastrophe [10]. Finally, Fig. 1c demonstrates Laurel's well-known plot structure model, which consists of several segments [11]. The slope of each segment and its degree show the amount of event tension: (a) represents the exposition, (b) the central action of the story, (c) where characters take major and convincing actions to obtain their goal, (d) represents a period of heightened activity and commitment where many probability lines are eliminated, (e) is the climax where one of the probability lines becomes necessity, (f) is the falling action representing the consequences of climax, and finally (g) represents the resolution [11].



**Fig. 1.** Linear narrative structures

An interactive drama may benefit from using rising suspension, tension, or complication to engage interacting subjects in the story. However, the problem of how to combine a linear structure with freedom of interaction still remains.



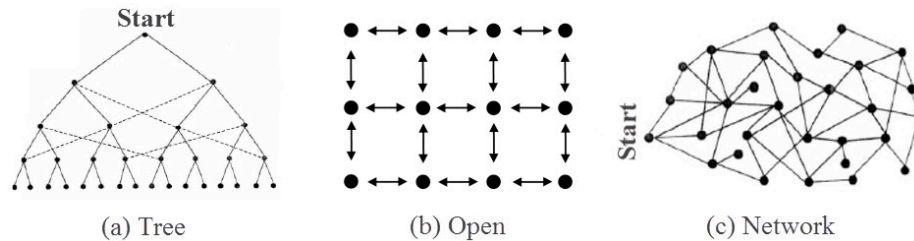
## 2.2 Non-Linear Structures

The storyline of the plot takes a different shape when interactivity is involved. Interactivity implies freedom for the interacting subject and differential readings of the narrative, which may interfere with the theme or topic intended to be communicated by the author, since there is often little or no control over how the interacting subject might encounter events in such narratives, as can be seen in the following few examples.

Fig. 2a illustrates the tree branching structure as described by Ryan [12]. When a specific branch or node is taken, there is no possibility of returning back to the decision node, and one of the problems that an author then faces is rapid growth after a few steps, which may lead to a combinatorial explosion [2].

Fig. 2b shows the open plot structure [13], which can look like a road map consisting of decision points that may carry the user to another point of decision – your decisions take you wherever you want to get. It is considered the most expressive format for the reader and the less expressive for the author [13]. In addition, the dramatic arc is almost abandoned for the interests of exploration, modification, and investment [13].

Fig. 2c demonstrates the network plot structure in which, according to Ryan [12], the recipient's movement will neither be free to navigate nor limited to a single course. The structure allows circuits, so the duration of visiting of each node cannot be controlled by the system. Furthermore, narrative continuity can only be possible from a single node to the next, or between sequences of nodes with single connections. For instance, the user may go through a node where it is narrated that a specific character is dead, and then subsequently move to another node where the same character might still be alive.



**Fig. 2.** Non-linear structures: (a) Branching: no way back; (b) Open: no dramatic arc; (c) Network: circuits allowed.

These are just a few structures of the many that have been used or postulated by theorists and designers. What they have in common is that they highlight the challenges faced by authors when organizing events in ways intended to provide a dramatic experience.

### **2.3 Emergent Narratives**

In the field of interactive storytelling, various attempts have been made by researchers to overcome the previously mentioned challenges of the narrative paradox and the combinatorial explosion.

Contemporary researchers in the field consider the “emergent narrative” notion – where the narrative can be generated as a result of interaction between characters – as one possible solution for the challenge of solving the narrative paradox [14,15,16]. Emergent narratives are often implemented by the use of AI, rule-based interactions, and intelligent agents.

These attempts to design systems that are highly non-linear focus on the developing of so-called character-based storytelling, where the story emerges from the roles played by the virtual actors, coupled with the dynamic interactions between these roles. Using AI techniques, the characters are assigned with different plans of action, and the actions they take correspond to possible behaviors, for example the expression of personality traits and moods. The user’s intervention causes alterations to the plot and interferes with the character’s actions. Based on this scenario, the user must be able to determine what a likely next move could be or how dramatic the ongoing event is. An eventual goal for the user would be, for example, to change the ending of a familiar storyline towards either a happier or a more humorous conclusion e.g. [17].

Another well-known example of an emergent narrative is “Façade”, which includes theatrical drama, while the structure of events follows the Aristotelian dramaturgic arc of tension, exposition, ascension, climax, and denouement/resolution [18]. Comparable to this approach is the interactive storytelling platform “Scenejo”. This application enables playful simulations of dialogue between animated 3D virtual agents and the user, by employing the chat-bot technology for a text-based interaction [19].

A final example which is relevant to the present context of didactic or normative content (in edutainment) is “Fear Not!” [20], which addresses the theme of bullying through role-playing with 3D characters.

These examples of emergent narrative experiences focus on allowing the interacting subject to intervene and communicate with characters in order to change the course of the generated stories. In this project we focus on a different issue, i.e. utilizing embedded events [21] in virtual environments to give the interacting subject the sensation of participating in the construction of a plot-based emergent narrative, while maintaining dramatic tension and engagement and, most importantly, assuring the effective reception of the intended content.

## **3 The Interactive Dramatic Experience Model**

Our exploration of integrating navigational interactivity with a plot-based narrative is driven by the goal of mediating an interactive dramatic experience that encourages the interacting subject’s individual story construction while sustaining engagement. The idea is that this can be achieved with a limited number of embedded events which, if

organized in a certain way, can produce the *sensation* of participating in the construction of an emergent narrative, addressing this way the challenges posed by the narrative paradox and the combinatorial explosion.

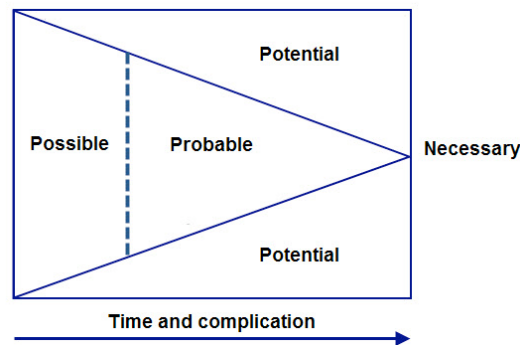
The proposed “Interactive Dramatic Experience Model” (IDEM) intends to provide authors with a method that can be employed to plan and lay out the organization of events in a manner that will guarantee the communication of a theme while at the same time allow the interacting subjects to experience navigational freedom in a virtual environment.

Our approach in developing the IDEM is inspired by investigations concerning authoring for emergent narratives, as in for example [15] and by taking the concept of the “Flying Wedge”, introduced in Laurel’s seminal work [11], as a very plausible starting point.

### 3.1 The Flying Wedge

The Flying Wedge concept is based on a theatrical point of view, whereby a completed plot in a play represents the whole action, and the potential of a play is formulated from a set of possibilities available to the author or playwright. As the play progresses, the number of possibilities of potential events decreases radically. These possibilities are influenced by the play’s enactment. The performed enactments eliminate some of the possibilities and make some others more probable.

As the course of events becomes more defined, the resulting decrease in possible outcomes “[creates] engagement and varying degrees of suspense in the audience” [11, p. 69]. These events lead to a final moment, or peak, at the play’s climax. At this point all the competing lines of probability are discarded except for one line, which then becomes the outcome. In this instant the whole action of the play is completed, and finally the probability becomes the necessity. This process is illustrated in Fig. 3 and can be described as the dramatic potential, which is formulated by possibility, probability, and necessity over time.



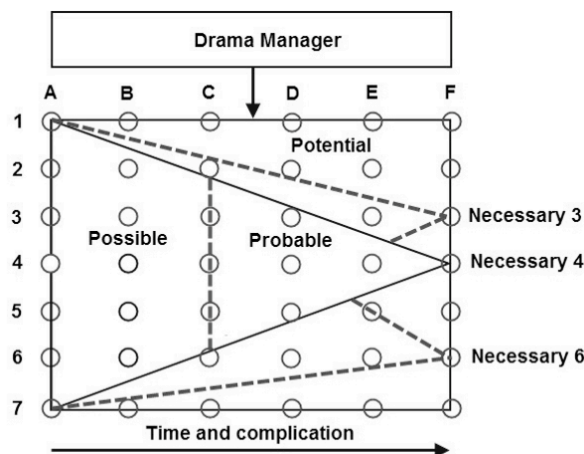
**Fig. 3.** The flying wedge – a plot’s progression from possibility, to probability, to necessary events [11, p.70]

The actions in human-computer interaction can also be described as having a beginning, middle, and an end. The beginning is made up of incidents that are parts of the whole experience. Therefore playing a digital game from the beginning to the end can be considered as a whole action. Human-computer activities are furthermore similar to drama in the process of formulating potential through progression from possibility, to probability, to necessity. For example, choosing a certain character at the beginning of a digital game initiates the process of delimiting the potential. Thus, the shape of the potential over time in digital games and interactive storytelling could be compared with the structure laid out by the flying wedge. We have therefore used this structure in a literal fashion to lay out the foundation for the IDEM.

### 3.2 The Structure of the IDEM

In our conceptualization of the IDEM, in Fig. 4, a few additions have been made to the original model introduced by Laurel [11]. First, a definite number of scenes (or stages) are organized linearly from A-F (in the example of Fig. 4). Each of these scenes consists of a column of equivalent “elements”, or “units” (represented as circles), which are possible manifestations for each of these scenes or stages of the narrative.

Additionally, a drama manager is included in order to organize and trigger specific events depending on the executed actions and navigational choices made by the interacting subjects. Any implementation of the drama manager should thus be concerned with selecting the available narrative elements in each scene. An author can therefore plan for and organize any number of narrative elements within each of the scenes or stages of the IDEM.

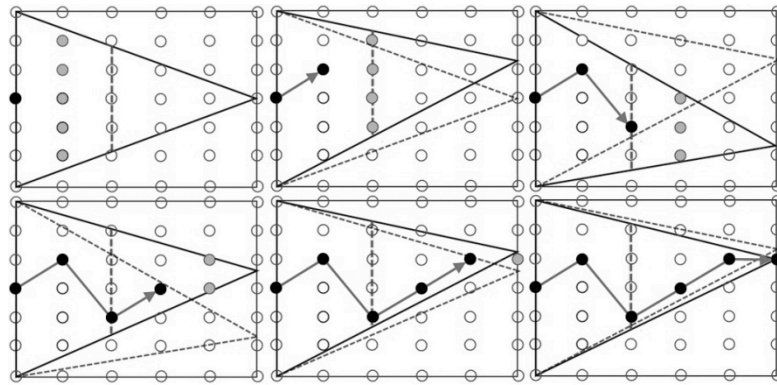


**Fig. 4.** The IDEM. A drama manager is added to the flying wedge, as well as the narrative elements represented by the circles.

The dashed vertical line represents the inciting incident, where the events begin to rise in tension in order to reach the highest level at the climax; it is also the threshold that separates the many possible events from the fewer probable events.

The moment the interacting subject experiences one of the narrative elements or events of the first scene (column A in Fig. 4), a rough notion of the whole action emerges and the subject starts to have expectations of what is about to come. The subject might then interpret the narrative elements encountered in the environment as the consequential effects of past encounters, which may stimulate curiosity and inspire her to go on to discover potential causes, thereby supporting engagement.

The gradual sharpening of the wedge is depicted in Fig. 5 by illustrating the progression from upper-left to bottom-right. This sharpening determines the amount of narrative elements available for the interacting subject (represented by the gray dots). Moreover, the subject's chosen and executed actions (represented by the black dots) determine which events are going to be available in the next step.



**Fig. 5.** The progress of an eventual story development, illustrated from upper-left to bottom-right.

As the story unfolds, the actions performed by the subject lead to a limitation of the number of possible events available further on in the experience. The drama manager uses the executed action to eliminate some events and make others more probable to be encountered later. In other words, the executed actions constrain further what may follow. Carrying out some actions make more sense than others in terms of cause and effect. Therefore, more probable lines and their degrees of suspense may increase the subject's engagement.

At the final stage – the necessity – all the competing probable lines or probable narrative events are eliminated except one. At this point the interacting subject has a single event (necessity) remaining to be involved in, which represents the peak, or the end (climax), of the story.

The IDEM makes it possible for the interacting subject to experience various storylines, beginning from a variety of starting points and leading to several story endings influenced by the subject's freedom of interaction, hence generating many possible experiences and story paths that are different from one another. Furthermore,

the experience provided by the IDEM is intended to be divested of any kind of game characteristic that might lead to the loss of dramatic tension in the overall experience (interrupt dramaturgy).

## **4 Case: The First Person Victim**

The IDEM presents opportunities to create interactive applications in different edutainment contexts. In this paper, the model's application is illustrated through the case study of our prototype – “First Person Victim” (FPV) – which is an interactive experiential storytelling scenario intended as a tool for learning about the consequences of war. This theme was chosen as a showcase for educational purposes, with the aim of contrasting with games and other experiences which may motivate the interacting subject to carry out violent and aggressive behaviors (e.g. shooting, killing, and demolishing) [22]).

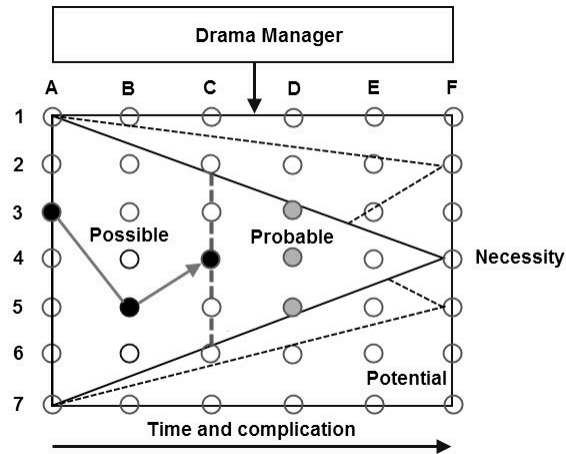
The theme of the FPV places the subject in the role of an unarmed civilian in a town, which is under attack by a foreign military power. During the experience, which lasts from 5 to 20 minutes, it is possible for the interacting subject to navigate freely in the virtual environment and thereby trigger various narrative elements. In the current prototype it is not possible to interact directly with other characters but only to witness tragic and dramatic events unfolding in the war zone.

The environment has been designed and implemented using the game engine Unity [23], which can be utilized to create a 3D First Person Shooter (FPS)-style environment and other types of experiences.

### **4.1 Applying the Drama Manager**

A dynamic drama manager in the IDEM has been implemented to control six scenes in the FPV experience (columns A-F in Fig. 6). Each scene consists of seven alternative narrative elements (rows 1-7 in Fig. 6). The experience thus comprises a total amount of 42 micro elements/events, which can be triggered by the interacting subject (although only seven will be experienced in a single passage). Each scene represents an area in the virtual environment. For example, scene A is an apartment, scene B is a street section, and scene C is nearby a tunnel. The spatial design of the virtual environment is not directly related to the IDEM, although layout of the space may support increasing necessity, tension and engagement.

The 42 micro elements may consist of events (e.g. an exploding fuel station), encounters (e.g. with a woman who is looking for her family), or interactive objects that allow the interacting subject to obtain particular information (e.g. a cellular phone conveying information on where to go). Each event is thus in the form of audio, visual, and audiovisual elements.



**Fig. 6.** The IDEM as used in the FPV. A storyline (the arrow) is determined by the flying wedge and the drama manager's selection of available events, and is generated based on the interacting subject's navigation and choices

The subject is, for example, able to trigger an “audio object” such as a radio to get some information, or to receive phone calls (Fig. 7a). It is also possible for the subject to receive visual mobile text messages and to interact with a TV and watch visual footage of the beginning of war at the same time as the first rocket is hitting the neighborhood (Fig. 7c). Furthermore, encounters with other characters are represented by audiovisual elements and consist of enactments of real actors projected onto a 2D plane in the virtual environment (Fig. 7b). The narrative elements in the IDEM can thus easily be expanded to many other kinds of expressive means, depending on the intention of the author.



**Fig. 7.** Examples of narrative elements in the form of (a) audio; (b) audiovisual; and (c) visual elements

Additional elements are macro-events, which are constantly active during the entire experience, independently from the interacting subject's actions. These events can, for example, be explosions, rocket attacks, air raids with helicopters, etc.

The narrative elements are triggered based on the factors of time, space, and proximity between the interacting subject and the objects. The subject may, for example, receive a phone call after a specific amount of time spent in the same location if the subject is not performing any actions. However, most of the events are triggered based on a specific distance from each event (the distance is unknown to the

interacting subject). Fig. 8a depicts a situation where the subject has moved close enough to be able to listen to one of the characters in the experience, who is offering to help the subject to cross the border in order to get to a safer place. Fig. 8b shows another event in which the subject discovers a rocket-launcher, which is the origin of the rockets fired into the town, and thereby realizes the cause and effect relationship in the story. Finally, Fig. 8c depicts yet another situation where the interacting subject has decided to leave the town and rockets are destroying a nearby residential area.



**Fig. 8.** (a) Meeting a character; (b) Military vehicle firing rockets; (c) City being bombed

The drama manager furthermore organizes and selects the events for each node. Each single event in scene A (see column A in Fig. 6) is connected to five possible events in scene B. Each single event in scene B again has connections to four possible events in scene C. This process continues further until a single event is available: this single event represents the climax in scene F – in our case the end of the tragic story.

The availability of node choices is thus generated by the drama manager as follows: If the interacting subject triggers in an event in node A3, for example, the next available events will be only in column B (however, not all possible events in column B), and if the subject then triggers the event B5, the next available events will be only a range of events in column C. The direction of interaction or the plot generation will be therefore always progress in order from column A to F based on the interacting subject's former actions.

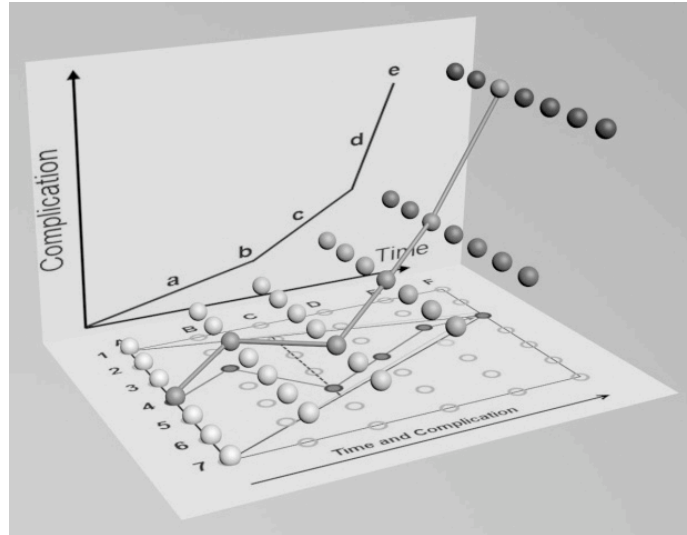
In order to illustrate this with an example from the FPV, let us assume that the subject triggers the event A3 in the apartment in Scene A that turns on the TV. This then enables the subject to watch the news and understand that the city is under attack. At least five of the next available events in scene B will then be causally related to the perceived information. Therefore, the following possible events might be that a neighbor knocks the door and tells the subject to hurry to leave the building (B3), or that a helicopter drops paper sheets with a message urging civilians to leave the city (B5).

The function of the drama manager is thus to allow certain events to be active for triggering by the interacting subject, while the remaining events will be deactivated. The author will therefore be in charge of deciding and implementing which of the events will be active at the various scenes, by taking into consideration the causal relationships between the events, so that every available event must make at least some sense with the previously triggered ones.



## 4.2 Maintaining Tension

In order to visualize the level of tension in the FPV, Fig. 9 shows the merging of Laurel's structural plot model for linear stories (see section 2.1, Fig. 1c) and the functionality of the flying wedge. Some segments in the original model have been discarded, namely 'f' (falling action after the climax) and 'g' (resolution). The reason for this is that we have chosen to follow the tragedy genre in the FPV, thereby ending the narrative at the most tragic incident which consequently is also the climax (see further explanation in [22]). In other words, the storyline comprises only segments (a, b, c, d, e), with (e) representing the climax or the necessity, in which case the concept will match with the functionality of the flying wedge that ends the story at the same level of climax or necessity. The single spheres that connect each of the single scenes from A to F represent the navigational choices made by the interacting subject, while the line between the nodes represents the generated storyline.



**Fig. 9.** The IDEM concept illustrates the storyline path generation, which maintains the dramatic arc of tension (further explanation in the text)

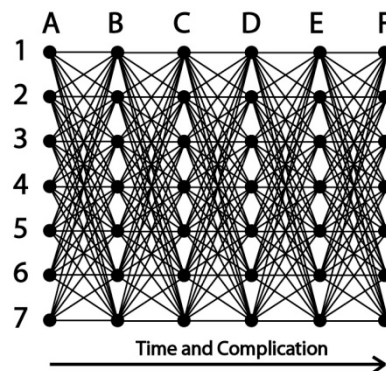
The figure also illustrates the gradual increase of event tension that is implemented with inspiration from Laurel's work [11], represented here by the gradient of the spheres from lighter to darker, the darkest being the highest level of tension among the events. For instance, witnessing an event where someone is being kidnapped (e.g. event B4) is lower in tension than the same person being shot (e.g. event F3).

The light gray color in the first row represents the tension of events as being very low. The events in the second row are a bit higher in tension, as the interacting subject witnesses or becomes involved in events that are tenser compared to the previously executed events. The third row of events, with a gradual darkening in color, involves more dramatic situations, wherein, for example, a man is trapped in a car which then explodes. When the interacting subject reaches the highest row of events (the dark

gray spheres) the subject may witness even more dramatic occurrences, for example the torture of a friend or a relative (in the story) being shot. The level of tension of events included in the IDEM should thus be planned by the author to increase gradually, if the experience is to have an effective dramaturgical development.

### 4.3 Plot Structure

The overall plot structure of the IDEM can be described as progressive, as it is moving ahead in one direction (Fig. 10). The availability of node choices is handled by the drama manager, as described in section 4.1, and the direction of interaction or plot generation will therefore progress from column A to F.



**Fig. 10.** The progressive plot structure of the IDEM. Each node in each column is connected to all nodes in the next column.

If we compare this structure with the branching tree structure mentioned in section 2.2, we notice that the outward branching becomes inversed with the aid of the flying wedge. The gradual sharpening of the wedge thus guarantees an inverse branching functionality, solving the problem of an eventual combinatorial explosion of story endings.

Another characteristic that may distinguish the IDEM from other non-linear plot structures is that it is intended to maintain the dramatic arc. However, the author will still be responsible for developing narrative elements to the predetermined nodes. The narrative elements in the rows of events should thus preferably have a gradual increase in tension and causal relationships between the rows, hence maintaining the drama and narrative coherence.

Finally, the pattern of nodes is not statically scripted – it is generated dynamically by the drama manager, depending on the interacting subject's input. This feature is thus an alternative to the static fold-back structure often used in games. The subject's choice and navigation furthermore determines the availability of the amount of nodes, and in addition specifies which nodes will be triggered next based on former actions. As such, the storyline is generated from the reciprocal interaction between the subject and the system.

#### 4.4 Sustaining Engagement

In order to supplement the drive of the drama, we additionally prompt the interacting subject's desire to continue the experience by using the Player Engagement Process framework [24] as inspiration to design for sustained engagement. We therefore, for example, encourage subject-defined intrinsic objectives. One way of doing this is by presenting conspicuous events, which obviously must have a triggering cause, but such cause remains implicit or not utterly revealed, triggering curiosity in the interacting subject to explore further and seek more information in her surroundings. For example, the subject might witness the explicit effect of exploding rockets, but she may be unaware of the implicit cause of the rockets, which then may trigger a desire to discover the location of the rocket launchers.

Moreover, a few events include extrinsic application-defined objectives (e.g. a character tells the subject to get to a van that can help the subject to escape out of the town). This way we might enhance the subject's desire to continue, the level of engagement, and the feeling of free navigational interaction.

The FPV application and the events of the IDEM furthermore support activities that might encourage interacting subjects to continue. Besides activities related to experiencing the story and characters, the subjects might also want to keep experiencing the FPV due to:

1. Exploration of the environment (e.g. supporting curiosity by making the locations interesting)
2. Experimentation with different story possibilities (e.g. trying the application again)
3. Solving problems (e.g. attempting to help a woman in a burning building)
4. Sensing the environment (e.g. through impressive effects of explosions and soundscapes)

Finally, we intend to make interacting subjects strive to accomplish progression in the experience (e.g. by advancing through the environment) and closure (e.g. to experience the climax of the experience and a sense of intelligibility).

In summary, we thus aim to motivate, engage, and move the subject forward through the dramatic experience, not only through the story, but also through the drive supported by the desire to continue.

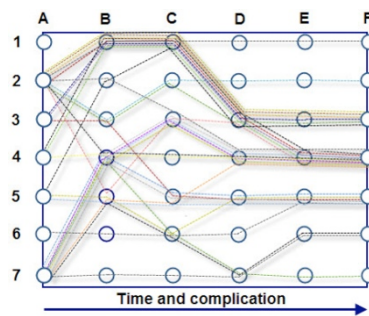
### 5 Evaluation and Findings

We have evaluated the application of the IDEM and the FPV prototype in a range of tests, which are mainly focused on evaluating engagement, the interacting subject's intentions during the experience, and learning outcomes [24,25,26]. These evaluations demonstrate that around 40% of the respondents experienced sustained engagement in the initial 15-20 minutes of the experience, and also wanted to try again, despite the tragic content. However, the main reasons for not wanting to continue in the prototype

were reported to be technical problems and level design issues, which thus leaves room for improvement.

In the current study the evaluation will focus on investigating the IDEM by evaluating variations in story generation, the navigational freedom of the interacting subjects, the level of tension, and finally understanding of the theme.

In order to investigate whether the IDEM has the potential for creating a diverse set of story generation outcomes based on a limited amount of events, an initial pilot test was conducted among university students ( $n=30$ , unique participants). Test participants were asked to try the FPV application, and each participant's storyline path resembling the triggered events was recorded by the application. The resulting data can be mapped as a graph, which is depicted in Fig. 11.



**Fig. 11.** Different storyline paths generated by the interacting subjects ( $n=30$ ), with some overlapping lines

The figure illustrates that some narrative events were triggered more frequently than others, resulting in overlapping story paths generated by the test subjects (shown as multiple lines in Fig. 11). Although some narrative events were encountered more than others, the graph illustrates that different participants in the test encountered diverse sequences of events and individual storyline paths. The results consequently suggest that the structure of the IDEM can support multiple story generations based on a limited amount of events.

This finding is furthermore supported by recordings of in-class self-reflections and discussions conducted after the experience in [26]. During these discussions test participants realized that they constructed different stories based on the various encounters and that they had very different experiences which made them want to try again. This variety of experiences may furthermore support repeated interactions and in-class discussions, as also suggested by [1].

Since the events encountered by participants were embedded in different locations in the virtual environment, the variations in the graph in Fig. 11 also illustrate the possibilities for freedom of navigation in the FPV. A series of qualitative interviews with university students, focus group participants ( $n=3$ ), and single respondents ( $n=11$ ) also supports this result. The respondents stated in general that the environment felt like an open world, where it is possible to navigate freely, exemplified here by one respondent's statement: "The map seemed very big, and I wanted to explore. I felt that I was on a path and I didn't reach it to see where it

ended". These results indicate that the environment of the FPV prototype indeed supports freedom of navigational interaction.

We have not yet evaluated systematically the change in the level of tension among subjects. However, in a run time evaluation, which is described in [25] university students and staff (n=22) reported that they experienced a range of feelings related to tension, such as agitation, nervousness, excitement and anxiety, tension, shock, dizziness, fear, worry, frustration (when unable to help others), powerlessness, anger, misery, disgust, desolation, and emptiness. Future studies are needed in order to explore variations in the level of tension in more detail.

An important parameter to the present study assesses to what degree the communication of the theme has been efficient, and, if so, whether the interacting subjects become acquainted with the theme of the FPV. During all the tests conducted, respondents reported that they understand that the theme is related to being a victim of war or being in a war-zone. In an evaluation among students in three schools (n=40, age: 13-18) [26], findings furthermore indicate that those students who were engaged in the experience more frequently experienced theme-related feelings and acquired knowledge concerned with the theme than non-engaged students. These results thus suggest that communication of the theme by employing the IDEM structure has been successful.

## 6 Discussion and Conclusion

One of the main tenets of the present work is that what is commonly referred to as the "theme", "topic", "substance", "thesis", or "content" is of central importance in some fields of interactive media. This is the case with edutainment, for if one wants to use digital, interactive, and narrative-based technology for pedagogical, educational, and didactic purposes, there must be a more or less explicit or implicit normative goal in the whole endeavor. From the "edu"-cational point of view, this normativity must be expressed in terms of the intended content and the desired learning outcome. On the other hand, from the enter-"tainment" point of view, the normative goal has to do with encouraging participation with high levels of engagement, fun, joy, playability, and the possibility of an individualized experience.

Edutainment is certainly not the sole field of application in which the intelligibility of particular mediated content is central to the goal of the system. However, some developments in interactive narrative, storytelling, and drama have focused on the generation of engagement by attempting to empower the interacting subject in the composition of the narrative, emphasizing the feeling of narrative closure and not the intelligibility of a particular thesis. The idea with the IDEM is thus to focus on conveying a theme as an interactive dramatic narrative *experience* rather than attempting to devise an application that *tells a story* based on user input.

In any case, two recurrent issues in interactive and non-linear narratives are the "narrative paradox" and the "combinatorial explosion", which pose interesting design challenges when mediating particular contents that need to be conveyed in a trustworthy manner. We set out to address these issues by suggesting the IDEM described herein.

Findings from the evaluation indicate that this model, exemplified by the current implementation of the FPV, provides interacting subjects with an interactive dramatic experience, which entails and presupposes the communication of didactic or normative content, while simultaneously maintaining freedom in navigational interactivity. Another characteristic of the IDEM is that it provides an alternative to the outward branching tree plot structure, described in section 2.2, by introducing an inverse branching structure based on Laurel's seminal idea of the flying wedge [11]. This feature ensures that an author will not risk a rapid increase in nodes, which may lead to a combinatorial explosion. Furthermore, when comparing the IDEM plot structure in Fig. 10 with the network plot structure in Fig. 2c, it is apparent that the IDEM does not allow circuits: A visited node can be triggered only once, while the current available possible events will have a causal relation to previously triggered events.

The model is furthermore intended to serve as a departing point for authors and designers given the task of embedding particular normative content in an interactive application. In this sense it might be of interest for people who are working in edutainment, in sustainable applications of digital interactive technology, in persuasive technology, or authors who have a particular stake in the "message" being mediated. It can also help in making a sharper distinction between design choices and authoring intensions. In applications that have a manifested agenda (other than mere leisure, as e.g. in edutainment), authoring involves assuming responsibility for the content.

We know that the same objectives and normative goals can be achieved in many different ways. In our model, once the authors have laid down their agenda and narrative goals, they can start structuring and planning the narrative using the logic and organization of the IDEM. Authors can then decide on the number of scenes and alternative manifestations of each scene (the narrative elements in the columns). For example – as in our FVP application – an author can start by describing events in the last scene, and then work backwards towards the first scene, while ensuring that there is always an option to encounter events which have a causal relation to earlier encountered events. After organizing these events in the IDEM matrix, the next step is a custom implementation of the drama manager (of which there can be many different realizations according to the particular dramaturgical needs). Authors can moreover use the IDEM for orchestrating engagement triggers, which may create the desire to continue participating in the experience as well as to plan for varying levels of tension. This feature contrasts with the open plot structure, described in section 2.2, by providing a discernible arc of tension.

Finally, after the actual authoring and organization of events, the design part comes into play. Here, many different aesthetic choices and combinations of media elements and resources can be used in the development of the different narrative elements in the IDEM matrix.

The IDEM is thus thought to combine the engaging and motivating aspects of a feeling of participating in an emergent narrative with the reliable reception of the content, so as to ensure the normative didactic goal of the system. Our motivation for the emphasis on "normativity" comes from our interest in the use of digital, interactive, and representational technologies in the mediation of ethically relevant and socially responsible themes. This can be seen as part of a larger concern on the

more general sustainability of these powerful emerging interactive representational technologies and the cultural and cognitive ecology of the content mediated through them [27]. This is how we arrive at themes concerning issues such as war, ecology, discrimination, social exclusion, violence, poverty, sustainability in general, and particularly the theme that we chose to exemplify our model, i.e. the consequences of war for civilians and refugees, as presented here with the FPV.

The implementation of interaction possibilities in the FPV experience is, admittedly, fairly restricted and simple in its current prototype state, as the interacting subjects are only able to interact through their navigation in the environment. However, the IDEM concept can easily accommodate AI-controlled 3D characters, as well as other types of interactivity and affordances.

We thus do not claim to have solved the narrative paradox, but merely suggest that using the IDEM in the authoring process may be a contribution in the right direction, particularly in the context of conveying serious themes. The use of such plot-based interactive storytelling scenarios for learning may therefore point to new directions and approaches for teaching and learning through edutainment and purposive interactive dramatic experiences.

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# Paper IV

First Person Victim: Using Interactive  
Drama and Tragedy to create Awareness  
about the Consequences of War.

*Conference proceedings paper  
Presented at the Meaningful Play conference  
Michigan State University  
East Lansing, October, 2010.*

Schoenau-Fog, H., Bruni, L.E., Khalil, F.F., Faizi, J. (2010). First Person Victim: Using Interactive Drama and Tragedy to create Awareness about the Consequences of War. In: Meaningful Play 2010: Designing and Studying Games that Matter – Online Conference Proceedings. Michigan State University, East Lansing.

First Person Victim:  
Using Interactive Drama and Tragedy  
to create Awareness about the Consequences of War

Henrik Schoenau-Fog, Luis Emilio Bruni, Faysal Fuad Khalil, and Jawid Faizi.  
Institute for Architecture, Design and Media Technology, Department of Medialogy,  
Aalborg University, Copenhagen, Denmark

### **Abstract**

What will you do when an air strike is announced, the attack is targeting your hometown, and you can hear the bombers coming nearer? How will you find your loved ones in the carnage after the explosions? What would it be like to be on the other side of the guns pointed at you by the invaders? What happens when we turn the roles around and the "First Person Shooter" becomes a "First Person Victim" experience?

Scientific and psychological studies claim a variety of triggers in video games with violent content may promote aggression. To oppose the violent behavior of players in these games, this paper will describe how the sources of aggression and first person shooter conventions have been exploited in the "First Person Victim" experience to create awareness about the consequences of war for civilians. The paper will also explain how our "Interactive Dramatic Experience Model" organizes the various events of the experience and mediates an emergent narrative by the use of the first person shooter form. The theme is communicated through the use of tragedy, and turns the roles around to let the participants encounter a realistic war-scenario while being confronted with ethical issues, by enacting the experience of being a victim of war. An evaluation of the implemented experience indicated that the participants were engaged in the experience, despite the tragic theme, and that they were able to acquire an understanding of the theme being mediated.

**Keywords:** Narrative, Drama, Interactive, Emergent, Experience, Engagement, Victim.

## First Person Victim:

Using Interactive Drama and Tragedy to create Awareness about the Consequences of War

### Introduction

Ever since the advent and popularization of video games there has been an ongoing debate and many investigations about the role of violent games as enhancers and triggering factors for aggressive behavior in frequent players (Levenson, Kiehl, & Fitzpatrick, 1995; Dill, C. Anderson, K. Anderson, & Deuser, 1997; Anderson & Dill, 2000; Anderson & Bushman, 2001; Anderson, 2004; Gentile, Lynch, Linder, & Walsh, 2004; Uhlmann & Swanson, 2004; Bartholow, Anderson, Carnagey, & Benjamin, 2005).

Many reports have actually shown numerous triggering factors in violent games, which promote aggressive behaviors and affective states. It is therefore very intriguing that in a time in which the notion of "corporate social responsibility" has become mainstream in the business world, and in a context in which the "public" has become very sensitive towards social, ecological and ethical issues, the game industry continues to promote and profit from violent themes in an ever expanding market. The question remains open on whether this preference is really consumer driven, whether it is just conformism within the industry, or, even worse, whether it is just a lack of creativity and responsibility on the part of authors and designers.

This state of affairs inspires us to propose inverting one of the most successful formats in which violent video games are implemented, namely the "First Person Shooter" genre (FPS). This paper describes the implementation of what could very well be called the "First Person Victim" (FPV), a narrative re-conceptualization of the violent first person shooter

experience intended to communicate how it feels to be on the other side of the guns, which allows the participants to experience a more realistic view of the consequences of war on its victims. We briefly review the literature concerned with identifying some of the cognitive, social, and cultural factors embedded in violent video games, which function as triggers of aggression and conflict escalation, and use them as inspiration for implementing reverse factors that could encourage empathy, peaceful behavior, and conflict avoidance.

We build on the conventions of 3D first person shooter dynamics, aesthetics, graphical interactivity, and even theme (we also use a war scenario), but we dramatically invert the logic of the FPS game. In order to deliver a different perspective of such a violent environment—as found in a war zone—we communicate the experience and the main theme via events in an “interactive emergent drama”; we resort to tragedy as a way to structure the experience in a dramatic fashion. This choice is inspired by the manifest belief in ancient Greek culture that the cathartic effects of tragedy should, and indeed did, play an important role in the moral and ethical development of the audience, therefore encouraging empathy and justice in society.

Independent of whether the enacted actions are virtuous or vicious, violent or peaceful, continuous and repeated practice or dramatization of such actions will decisively influence the personality and behavior of a person carrying out, enacting or simply witnessing such actions (Boal, 2000). The implications of violent video games are obvious. Interactive applications such as computer games have the potential to be one of the most efficient media formats for providing participants with the ability to practice specific types of actions dependent on the context of the designed game. In this regard, the intentions, creativity and awareness of the author play an important role in providing the participant with a meaningful and coherent context with which to interact.

The present work intends to exemplify some of the potentialities of interactive drama, storytelling and video games for sustainable, ethical and socially responsible applications that could offer the user an active and instructive opportunity to be in contact with sensible issues in contemporary society. It is a humbling encouragement for authors, storytellers and game designers interested in this kind of awareness and in creating awareness.

### **Mediated Violence and Aggression**

In the present context, an operational definition of aggression is important. In this study aggression will be defined as “*any form of behavior directed toward the goal of harming or injuring another living being who is motivated to avoid such treatment*” (Baron & Richardson, 1994, p.7).

Individuals differ significantly in their tendencies to commit violence (Dill et al., 1997). Olweus argues that these differences appear by the age of three and remain stable over time, and concludes that the individual’s understanding of the situation is essential in determining his/her behavior (as cited in Dill et al., 1997, p.273). Moreover, Huesmann, Eron, and Yarmel (1987) claim that aggression in childhood is a precursor to a criminal record and a decline in intellectual functioning in adulthood, as the early formation of aggressive conduct leads to behaviors that are incompatible with intellectual development. This claim is also in accordance with Aristotle, who posited that the formation of habits (the intentional and constant ability to carry out action) should begin in childhood (Boal, 2000).

Studies have shown that more hostile, or characteristically aggressive, individuals have easy access to aggressive thoughts and feelings when exposed to violent content. Furthermore, the psychological effects of playing violent games have a greater negative impact on children (Gentile et al., 2004). Such types of games provide the player with the ability to repeat violent

actions continually, which may lead to and generate antisocial behavior in the recipients (Levenson et al., 1995).

According to Uhlmann and Swanson (2004), playing violent video games leads to the automatic learning of aggressive thoughts and behavior. For example, playing a game such as Doom associates the participants with aggressive traits and actions. Greenwald, Banaji, Rudman, Farnham, Nosek, and Mellott (2002) claim that the “self” is a knowledge structure prearranged as a network of association. Markus and Nurius claim that within this structure are multiple possible selves in which some are more chronically accessible than others: “Over time, repeated priming of a more aggressive possible self may make it the actual self, as it becomes the most chronically accessible self-representation” (as cited in Uhlmann & Swanson, 2004, p.49).

### **Copycat violence**

As stated in Anderson (1997), “story lines in which the violence of the protagonist is both justified and successful are more likely to produce increases in short-term aggression by the viewer than is unjustified or unsuccessful violence” (p. 162). The transferring of violent tendencies from violent media to the viewer thus occurs in a copycat fashion, in which the viewer learns a number of new ways to harm others. Anderson (1997) reports a real life example in which two armed men killed three people by forcing them to drink liquid Drano; the killers had seen such a method of killing in the movie Magnum Force. Anderson et al., Berkowitz, and Geen claim that exposure to violent scenes primes aggressive thoughts in semantic memory through a spreading activation process: “This priming effect thus increases the probability of an aggressive response to some provocation, real or imagined, by increasing hostile affect, by promoting hostile interpretations of the provocation, or by instigating use of aggressive behavioral scripts” (as cited in Anderson, 1997, p.162).



**Aggressive solutions**

Particularly regarding the role of violent video games in promoting hostile behavior in recipients, Anderson and Dill (2000) argue that they encourage aggressive solutions to conflict situations and provide a forum for learning such antisocial or hostile behaviors. Moreover, the effect of violent video games is cognitive in nature and can influence recipients in both short- and long-term play. In short-term playing, it appears to affect aggression by priming aggressive thoughts. In longer term playing, “the player learns and practices new aggression-related scripts that become more and more accessible for use when real life conflict situations arise” (Anderson & Dill, 2000, p.788). Continuous and repeated exposure to violent video games affects a player’s personality, leading to consistent increases in aggressive effect.

**Active participation**

The characteristics and active nature of learning environments within video games imply that this medium is more dangerous than TV and movie media as far as violent content is concerned. Anderson and Dill (2000) conducted a test on college students within and without laboratory conditions using their general affective aggression model. The results showed that students who played violent video games inside the laboratory “behaved more aggressively toward an opponent than did students who had played a nonviolent video game” (Anderson & Dill, 2000, p.787). On the other hand, for the tests conducted outside the laboratory, “students who reported playing more violent video games over a period of years also engaged in more aggressive behavior in their own lives” (Anderson & Dill, 2000, p.787). The same study also showed a positive association between violent video games and an aggressive personality, meaning that extensive exposure to violent video games contributes to the creation of a belligerent personality. The latter finding is also supported by Huesmann,

whose empirical data on TV violence also suggests that violent video game exposure causes “decrements in academic achievement because of the disruption of progress in school that is associated with increases in aggressive behavior engendered by media violence exposure” (as cited in Anderson & Dill, 2000, p.782).

### **Weapons and aggressive behavior**

Another interesting factor is that, according to studies conducted by researchers for over 30 years, the mere presence of weaponry increases aggressive behavior and leads people to behave more aggressively than they would otherwise in situations where there is no access to a weapon. An explanation for this effect involves priming: the identification of a weapon can automatically increase the accessibility of aggression-related thoughts (Bartholow et al., 2005).

The logic is simple—in the Western world, guns are associated in memory with concepts that involve aggression and hostility, because they are viewed as instruments designed to kill and hurt people. Furthermore, “weapon concepts become linked closely in semantic memory with aggression- and hostility-related concepts because of their similarity of meaning” (Bartholow et al., 2005, p.49). The implication here is that the more one plays with fake guns (as in video games), the more one is prone to non-gun-related aggressive behaviors.

### **Reasons for aggressive behavior**

Anderson and Bushman (2001) advance a plausible explanation for the observable increase in aggression and violence that derives from being exposed to violent media. They claim, “the enactment of aggression is largely based on the learning, activation, and application of aggression-related knowledge structures stored in memory (e.g. scripts, schemas)” (Anderson & Bushman, 2001, p. 355). They conclude that violent media increases aggression by a) teaching viewers how to aggress, b) priming aggressive conditions, c)

increasing viewers experience through arousal, and d) creating an aggressive affective state as a result of media consumption.

As exemplified by this short review, a consistent body of research indicates that exposure to violent video games can be considered a public health threat to children and youths (Anderson & Bushman, 2001). The question we therefore have to ask is how can this knowledge about factors that trigger and stimulate violence be used to counteract and prevent aggressive attitudes and instead sensitize towards socially responsible tendencies?

### **Creating Awareness about the Consequences of War**

While this introductory review on the relation between violent video games and the manifestation of aggressive behaviors was by no means intended to be exhaustive, it has allowed us to identify certain causal links or factors that can potentially promote or trigger aggressive attitudes. Following on from this, our intention is to use these factors to exemplify how authors of interactive drama and/or storytelling, including video games, can consciously implement ideas that go in the opposite direction of promoting aggression, instead enhancing the exploration of empathy, peacemaking, social responsibility, and other similar values.

In our example, it would be the authors' intention to confront the participant with a more realistic situation than the disproportionate, destructive virtual realities portrayed in the most successful FPS games. In order to counteract the aggression-promoting tendency of these types of games—and their highly unrealistic scenarios—we proposed to experiment with what we call the “First-Person-Victim” involved in an equally violent war scenario (as is usual in typical FPS games), but from the perspective of a normal and healthy human being who is confronted with something as terrible as the consequences of war violence in his or her homeland, rather than from the unrealistic point of view of an invincible and destructive soldier or warrior.

To make the participants aware of and acquainted with the devastating impacts and consequences of war, the designed context and theme were created in such a way as to reflect and represent a war torn country. The participant is able to follow the outcomes of violent actions, rather than practicing aggressive behavior, by navigating and interacting in different dramatically engaging events, and by linking causal relationships between the events.

Participants should be able to construct an emergent narrative in their imagination progressively, which will depend on their personal background, abilities and the way each individual interprets the events. The total amount of encountered events by the participants enables them to generate a story path that rises in tension until it reaches the highest level with an unhappy, tragic ending to evoke the maximum impact of catharsis.

### **Dealing with the Elements of Aggressive Behavior**

To communicate the theme, some of the sources of aggression identified in the previous review can be used as inspiration for designing some of the constraints and parameters in the application, in order to provide an experience that goes in the opposite direction of stimulating violent actions, promoting instead ethical decision making.

The first key element is the storyline. Contrary to the traditional role of the protagonist in violent games, in which the hero advances by increasing his/her destructive power during the development of the story, the role of the protagonist in this implementation tends to be more realistic. As the character proceeds in the story and encounters sad and dramatic events, the more powerless and hopeless he/she may feel, instead determining strategies to avoid violent situations and any harm inflicted by others.

Another parameter is to invert the narrative context of traditional first person shooter games. For example, this would involve creating an environment where a series of tragic events unfold, manifesting the impact of extreme violence (e.g. a residential area hit by an

airstrike with civilian survivors asking for help), where instead of empowering the participants to successfully use characteristically aggressive actions to overcome the situation, they will be in a vulnerable and oppressed situation with little power to avoid harm from their surroundings. The participants will witness different tragic events by taking the role of a victim of war experiencing distress through the passage of several tense events as they get closer to the deadly war zone. This point is related to avoiding “practicing aggressive solutions”. In fact, and on the contrary, the participant will listen to the other characters suffering, and then try to find suitable solutions for an unarmed civilian victim. There is, of course, active participation from the protagonist’s side, but it will not be active participation in a violent direction.

As in all FPS games, weapons are present in the environment, but the novel fact here is that the participant will take on the role of a civilian victim with no access to weapons, which will be in the hands of the oppressors so the participant can experience the negative impact of facing an armed foe (fear, threat, etc.).

Regarding physiological arousal, experiencing some of the physiological reactions associated with fear, frustration and powerlessness will hopefully prompt a reflection on the participant that war is actually not a game and certainly is not fun, eventually triggering more empathic feelings towards fellow humans who in real life are hit by war, oppression, forced migration, social collapse and disintegration, to name but a few. Instead of creating an “aggressive affective state”, the objective should be to produce an “empathic affective state”.

### **Communicating the Theme through Tragedy**

In order to employ an alternative to the usual “be the hero” stories in violent games, and to convey the experience of being a victim of war when encountering the FPV experience, we

have taken inspiration from the way of understanding tragedy in the tradition of the classical Greek philosophers, who saw in tragedy a powerful tool that could be used to purge noxious tendencies in individuals. By using the tragedy category of drama as a format for communicating the theme, the implementation of the interactive emergent narrative enables the participants to encounter different dramatic events, each varying in tension. Boal's investigation of Aristotle's classic tragic system (Boal, 2000) was the main inspirational source for this particular work.

In tragedy, actions carried out by the protagonist will be based on his rational soul (the intellect), and his goal will be the supreme good leading to happiness (Boal, 2000). In this view, the protagonist becomes involved in an activity, has a goal, and will be rewarded. This can be analogous to the characteristics of the participant's engagement in a game or interactive application, where engagement can occur when the participant is motivated by his own goals to explore the settings and the storyline. Through such motivation, participants then want to continue their activity by advancing through the process to reach the goal, which for example, could be the completion or closure of the story. Having traversed the experience, they can achieve a reward, which, for example, could be the satisfaction of acquiring an understanding of the situation—and the catharsis that can be experienced by such understanding. The essence of tragedy is the process of correction or purification of human actions stimulated by such a cathartic process.

In linear narrative structures, the subject is a passive observer. As a result, the audience is limited to experience only reactions without being able to carry out any actions. The audience is thus limited to following a predetermined path assigned by the author, in which case they might become disinterested or be less motivated in some of the subparts of the theme. Hence, reaction can be frustrating and unrewarding in some instances. Experiencing

action, though, is usually rewarding, as even a bad action can help in learning from mistakes made.

We think that computer games offer great potential for the implementation of the original intentions of tragedy. The interactive affordances of video games offer outstanding possibilities for providing participants with the ability to carry out actions in a predetermined context. Consequently, a key ethical issue is what sort of content should be implemented with such a powerful emulating tool.

According to Aristotle, the process of practicing meaningful actions for character development must begin in childhood (Boal, 2000). To bring the participant to a world where he is able to carry out meaningful actions, the art of tragedy and its main themes can be merged with human computer activity. In this way, the participant can enter the fictional world, taking over the role of the tragic hero, which will enable him or her to take the actions necessary in an attempt to correct errors that take place in the visited world. The actions executed will have direct impact and influence over the overall outcome of the story, and in turn the character of the participant.

### **Interactive Drama**

In order to present the participants with an experience supporting the communication of a relevant theme, and to provide her/him with the ability to carry out meaningful actions in an interactive experience with serious content, we chose to implement the first person victim experience (FPVE) application as an interactive drama. Choosing the term “interactive drama” is based on the fact that drama is to act, and as a method of narration it conveys stories through actions performed by actors (mimetic or dramatic narration) (Ryan, 2001). In the case of the theme implemented in our model, which is communicated based on a narrative structure resembling tragedy, the emphasis is therefore on action, since if there is no action there is no

tragedy, as claimed by Aristotle (350 B.C.E.). Tragedy and drama share this emphasis on action, so as a consequence the participant will enact the role of tragic hero by taking the necessary actions to avoid the aggressive behavior of others.

We would thus argue that in an interactive drama the participant has to perform actions to experience the theme, by interacting *in* the story as opposed to interactive narrative or storytelling, where the participant interacts *with* the story.

Usually, in many games and interactive experiences, the protagonist being controlled by the participant overcomes the challenges. However, our attempt in the present work is to invert this concept in such a way that instead of providing the participant with the abilities to attack others (as in typical first person shooter games), the participant will take the role of being a victim under attack. The main objective will be to save him- or herself, as well as the lives of others. In this way, we hope to provide the participant with the opportunity of emulating virtuous actions such as saving or helping others by peaceful means, instead of simply enacting violent actions.

The participants should thus become stimulated to become acquainted with the social and ethical issues related to the experiences of being a war victim and, by understanding the theme (provided by the authors), engage in the experience itself. Our implementation intends to provide the participants with the opportunity to enact the drama actively, and the more they become engaged, the more they will feel stimulated and engaged with the theme.

### **The Interactive Dramatic Experience Model**

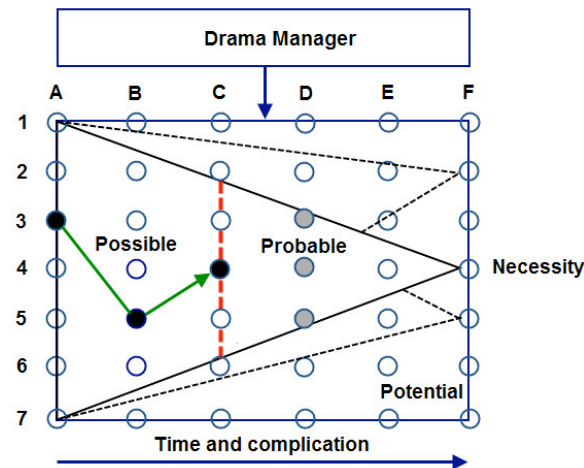
In order to communicate the theme, events encountered by the participants are organized by our Interactive Dramatic Experience Model (IDEM) (Schoenau-Fog, Bruni, Khalil, & Faizi, 2010), inspired by theoretical work concerning the “flying wedge”, as conceived by Laurel (1993). The model is derived and based upon the Aristotelian point of



view, which states that the potential of a play is formulated by a set of possibilities set out by the playwright. As the enactment progresses, the number of possibilities decreases radically. In addition, the performed enactments eliminate some possibilities and make others more probable.

These events lead to the final moment, or peak, of the action. At this point, all competing lines of probability are discarded except one line, which becomes the outcome. At this precise moment, probability becomes necessity. This process, which can be described as ‘dramatic potential’, is formulated into possibility, probability, and necessity over time. According to Laurel (1993), action in human computer activity can be defined as having a beginning, middle, and an end. The beginning is made up of incidents that are part of the whole; therefore, playing a computer game from the beginning until the ends constitutes a whole action.

In the implementation process, the original model was modified and adapted. Forty-two events were postulated, as spatially and chronologically represented in *Figure 1*, which shows time elapsing from left to right and circles representing potential events. A drama manager was implemented in order to trigger specific events based on the participants’ choices and actions. The events are distributed in seven numeric rows (1-7) and six columns of scenes (A-F).



- *Figure 1.* The flying wedge eliminates available possible events to a few probable ones, and finally to a single necessity (the climax). (Schoenau-Fog, Bruni, Khalil, & Faizi, 2010)

The green arrow represents the constructed story path, which is dependent on the chosen or executed actions made by the participant, and the shape of the story path is determined by the triggered event. Black circles represent the triggered events in scenes A, B and C. Assuming we always keep the participant in the middle of the wedge, the decrement of the events is controlled by the gradual sharpening of the wedge and by the drama manager (the grey circles). The dashed vertical line represents the threshold that separates many possible events from fewer probable events, as well as an inciting incident where the events begin to rise in tension to reach the highest level of the climax.

The overall story starts and ends in a specific spatially defined place, and the direction and functionality of the wedge are applied spatially to the 3D world—assuring increasing necessity. It is not possible for the participant to predict the assigned events and the availability of the interaction inside the wedge, because it is dynamically triggered by the drama manager based on factors related to the coherence of time and space in relation to the participant's spatial navigation and/or executed actions.

### **The Experience**

The main objective of the FPVE is to prompt a sense of empathy in the participant that will eventually stimulate his or her curiosity to search deeper into social and ethical issues in general and, particularly in our example, issues related to the suffering of people in war zones. To communicate the experience of being a victim, the events, locations, and the overall theme provided in the experience depict a war zone situation, and the narrative includes a tragic ending aimed at evoking the maximum level of catharsis.

Because the FPVE attempts to invert traditional FPSs that are mainly motivating the player by the actions of shooting, killing, and demolishing, the role of attacking is switched around. The participants thus experience how it feels to be on the ground during an airstrike and invasion by a foreign power, where they are in immediate danger and under constant attack.

The application and narrative circumstances will not afford them the opportunity to enact or participate in violent actions, but will, on the contrary, lead them to experience violence committed by an aggressor. The concept of the FPVE encourages the participant to find other solutions to problematic situations rather than shooting, using violence, or retaliating, thus bringing the gamer as close as possible to a more realistic experience and perception of the sufferings of other people in a war zone.

The usual game-defined goals in the FPS genre are replaced by engaging the participant with self-defined goals. The participant will be engaged in different dramatic events by these self-defined goals, and the way the participant interprets the events will influence these decisions, which in turn will create new goals in this fictional world. The main objectives might, for example, be to save his or her own life and the lives of loved ones. Going through the entire experience while being engaged by these objectives, the participant will be able to

interpret the surroundings and different events in such a way that he or she constructs an emergent narrative in his or her own imagination.

Engagement is a central element of the project, as it is essential to engage participants with dramatic events in order to keep them participating in the experience in such a way that, through their involvement in the story, they will become acquainted with the social and ethical issues implicit in the theme. Contrary to the usual triggers of engagement, the experience will not provide any specific application-defined (intrinsic) goals initially; however, events in the entire experience are causally related to each other, as the actions executed by the participants influence the availability of other probable actions. For the participants to become engaged, self-defined (extrinsic) goals are triggered mostly by stimulating their curiosity to find the causes of the different situations they are experiencing.

The application is built using the game engine Unity 3D, which makes it possible to create a high-level graphical 3D environment. The narrative elements and events are located in both time and space, organized by the IDEM and presented in the form of audio, video, and text. The videos include recordings of real actors, and are inserted in to the virtual world as video textures on planes in 3D space. The main point of using videos is to integrate footage of real characters acting in order to ensure better and more detailed expression, which would require far more resources to implement using customary 3D modeled and animated characters. Having videos of real actors in the virtual world is a design choice aimed at assuring natural facial expressions and body language, both of which play an important role in relation to showing emotions such as fear, pity, and empathy.

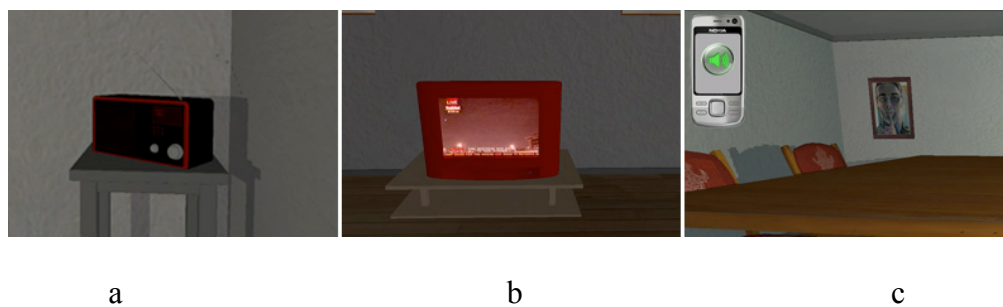
### **Being a First Person Victim**

In order to communicate the war scenario, various events in the IDEM are triggered by the participant's navigation through the 3D world. In the following paragraphs, we will

describe some of these events as examples of how the experience is conveyed.

In the first scene, the participant is located at home in an apartment (*Figure 2a.* depicts interaction with a radio). When within a specific distance of the radio, its color turns to red, illustrating the affordability of the object, and when the participant clicks to turn on the radio, the news of an eventual attack is being announced.

In *Figure 2b*, the participant is interacting with the TV and absorbing information about the very first airstrikes that are hitting the city, while simultaneously a declaration of war is being broadcast. The image in *Figure 2c* shows another possibility for interaction, which is triggered automatically after a given time threshold in which the participant has not actively interacted with the visual elements intended to alert him or her of the impending danger. Intended for a more passive kind of participant, this kind of affordance is triggered after a specific amount of time spent in the first scene without interacting with any object. In this case, the participant receives a phone call from a worried mother, encouraging the participant to leave the town.



- *Figure 2.* A radio, TV, and mobile phone are used to convey information in the first scene

*Figure 3* shows a number of other different possible events for the first three scenes. The first event (*Figure 3a*) depicts an explosion destroying the apartment. When the participant leaves the home in *Figure 3b* and hears the sound of military airplanes flying

above the city, striking one of the residential buildings and causing a devastating blast, the participant becomes aware of the danger that civilians face in such circumstances. In the third scene (*Figure 3c*) the participant is meeting a local person from the neighborhood that needs help.



a b c  
- *Figure 3.* Explosions in the neighborhood and a woman in distress

In *Figure 4a* the participant is situated inside a van while the driver attempts to avoid gunmen by finding a shorter way through the mountains to the safest side of town. *Figure 4b* shows possible interaction with a local neighbor, who gives information about the arrest of the participant's brother; the neighbor describes how serious and dangerous the situation has become, while encouraging the participant to leave town.

*Figure 4c* depicts one of the gunmen blocking the road, preventing exit and threatening local people with death if they attempt to leave the town.



a b c

- *Figure 4.* The participant's point of view from inside a van, and encounters with various characters.

In *Figure 5a* the participant is passing by and witnessing a neighbor being hanged by the gunmen after a failed attempt to escape from the town. To assure coherent causality, triggering this event will only occur if the participant met the neighbor earlier in the story (see *Figure 4b*).

*Figure 5b* depicts a possible story ending at the level of climax, in which the participant witnesses the arrest of the brother, who is then interrogated by one of the gunmen after tying him to a chair and blindfolding him. The gunman then demands an amount of money for the participant's brother to be released.

Finally, *Figure 5c* shows another possible ending where the participant watches hopelessly while a girl (possibly a sister, girlfriend, or friend) is being tortured. As the events are causally related to each other, the two story endings depend on the participant's choice and interaction in the previous scenes.



- *Figure 5*. An event from the fourth scene, wherein the neighbor is hanged, and two different story endings, or climaxes (b & c).

### Evaluation

To assess the concept of the FPVE and its ability to communicate a theme, evaluation through a series of qualitative interviews (n=11) and a focus group interview (n=3) was

conducted. Furthermore, a quantitative test was also conducted through a questionnaire (n=19, frequent gamers).

Overall, the results indicated that the participants understood the theme through their experiences, and they were motivated and curious to explore the environment, despite the tragic content. In particular, they were eager to find out the final outcome of the story. Moreover, they demonstrated an interest in trying the experience more than once, and were motivated to try such a type of experience again. The participants were also willing to be engaged in the dramatic encounters, which attached them empathically to other characters in the environment. To demonstrate some of the responses from the evaluation, the following sections present various statements concerning the participants' experiences.

### **Exploration and Curiosity**

The participants' willingness to explore the environment can be exemplified by the sentence: *"At the end, I wanted to get all my questions answered. And [to] see what else [is there], to further explore the town"*. Another respondent stated, *"I think I was not done exploring"* and *"The map seemed very big, and I wanted to explore; I felt that I was on a path and I hadn't reach it yet to see where it ended"*. Furthermore, another participant expressed his interest in the experience from a different angle, as he was interested in the experience *"not for entertaining"* but *"to understand a given situation...learn about how things practically work"* in the environment. Yet another respondent was interested in the form of the experience: *"the whole theme was very nice, the whole scenery, and people with guns, very interesting war scenario"*. These statements indicate that the participants were able to identify the environment spatially, as well as the overall context of a war zone situation. The experience also triggered curiosity, as indicated by one respondent who stated, *"I was interested to see all the effects and the landscapes"*, which was supported by yet another



statement: *“I had to discover what it was all about”* and *“there was something going on, and I wanted to figure out what it was”*.

### **Emotions**

A number of emotions were also encountered. For example, seven out of ten participants expressed their frustration, mostly because they were unable to save or help others when needed. For example, a test subject stated, *“I got frustrated that I couldn’t save the girl and the guy hanged out there; I was helpless, I couldn’t do anything”*. This limitation can also be seen as a realistic element in the communication of the theme, as an unarmed victim of war has very few options to alter the course of a situation.

### **Understanding the communication**

Regarding the participants’ understanding of the theme and awareness of the overall situation, one of the test subjects reflected on his knowledge by stating that he had *“experienced a start of a war”*. Moreover, a test subject described the experience as a *“sort of unique experience—it is a different take on war in games, because you take such a completely different perspective”*. Another respondent explained the theme in more detail: *“I couldn’t say what country I was in, but it was a war torn country... It was a suppressed city. They were suppressed by probably a foreign government”*.

Violent characters were also distinguished from victims, as exemplified by one test subject describing non-armed characters as *“victims... in occupying scenery”*. Another expressed the overall situation as *“an occupied country... civil war, terrorists, and soldiers who restricted your access”*.

Since the participants in the experience were divested of any kind of aggressive tools, they attempted to find alternative solutions to shooting at the aggressors blindly. Such an attempt can be interestingly characterized as a non-violent solution. For example, some test

subjects tried to get in contact with the civilian characters as an attempt to understand what was going on. A typical response amongst participants can be highlighted by the following: *“I was hoping that I would have gotten to talk to more of them. Or get more information out of them...[to find out] who were the suppressers”*.

### **Social and ethical issues**

Regarding the aspects of social and ethical issues, all the test subjects expressed their willingness and tendency to aid others that needed or called for help. To describe this motivation, a test subject stated *“There was a guy hanging, I tried to get in, and interact to get him down”*, while another respondent added, *“I wanted to help but I couldn’t enter the building. Because you can hear someone screaming there as well, you wanted to go inside to see if you could help people, but it was not possible”*.

### **Discussion**

The test and evaluation demonstrate that the IDEM and the current implementation of the FPVE bring participants close to events that involve the suffering of others, and make it possible to create a feeling of empathy. The majority of the participants had high tendencies to attempt to help other characters, especially those who were being tortured. In other words, they were often willing to act altruistically out of compassion for others. Additionally, the participants’ actions were influenced by not having the power to save their fellow man, and their actions were based on finding solutions or possibilities different to shooting or using violent actions, such as communicating directly with civilian characters to figure out what was going on and to obtain more information about why the oppressors were behaving so aggressively.

The responses concerning social and ethical issues indicate that inverting the traditional concept of an FPS game may potentially encourage non-violent behaviors as a solution to overcoming problematic and inherently violent situations.

### **Using violence in games constructively**

It is necessary to mention that not all researchers are in agreement about the linkage between violent videogames and the stimulation of aggressive personalities or behaviors. For example, Ferguson (2010) disagrees with the claims prevailing in the literature, claiming that communities in general react emotionally rather than objectively to the idea that violent video games may have positive impacts. He goes on to posit that video games can be effective in communicating information and not in transmitting moral beliefs, as information can be transferred by playing a violent video game and an aggressive personality trait cannot (Ferguson, 2010).

Since the violence is encountered as a victim and not as an aggressor in the FPVE, it could have a positive impact on the effectiveness of the communication of the theme. Because the roles are inverted, it may thus become possible, if not to transmit, at least to prompt a reflection on moral and ethical issues.

Other researchers place emphasis on the context in which violent media is viewed. For example, according to Huesmann and Miller (1994), the media violence effect can be reduced through discussing violent episodes, especially with children, by explaining the undesirability of the violent solutions and proposing non-violent alternatives to problems. This can be done by the process of socialization, which involves helping children to regulate and control their behavior by teaching and encouraging acceptable behavior and discouraging unacceptable

alternatives. Parents take a major role in the socialization process as well as peers, teachers, media, TV, and video games.

In the case of the FPVE, the context is also essential. Due to its strong impact on some participants, the intention is to use the application in educational contexts, where ethical issues encountered can be discussed after the experience. Moreover, the context can play another role; for example, by acquainting the participant with the negative impacts and undesirable consequences of war, the context convinces the participants indirectly that aggression and violent behavior are not the ultimate or the best solutions to problems.

The FPVE does not function as a traditional game concept (due to the goal structure and limited interaction (only navigation and activation)). However, it enhances the participant's drive, engagement and freedom of interaction by creating the possibility of participant-defined (extrinsic) goals, as opposed to application-defined (intrinsic) goals, to motivate and drive the participant through the experience in the dramatic action.

It can be said that some of our hypothesis can be validated. Applying and adapting the tragic system to interactive applications has the potential to involve participants more with the content as an active participant in the fictional world, rather than being a passive observer from outside that world. As a result, this could lead to the participant becoming more acquainted with social and ethical issues. Hence, utilizing interactivity in a mediated theme predetermined by the author can play an important role in conveying useful messages to participants. Being able to carry out meaningful actions consistently through tragic content that leads to catharsis, the concept provided by the First Person Victim interactive dramatic experience can be used to discourage noxious tendencies in individuals by communicating to them socially and ethically important issues.

### **Conclusion**

Using tragedy and applying the elements of drama to interactive applications can play an important role in conveying useful or socially and ethically related themes. In our example, the participants are able to interact, receive information from different characters, and get involved in different causally related events, which, in this case, enable them to experience firsthand what it is like to be a victim of war. Using the IDEM model as a communication tool has great potential for delivering themes that acquaint participants with important social and ethical issues, foster understanding between cultures, and enhance the desire and willingness to carry out altruistic actions. We see this normative aspect as a contribution to a not yet well-defined field of “socially responsible interactive digital media”.

Employing the general concept of the Interactive Dramatic Experience Model, undertaking meaningful and altruistic actions can be further utilized in the design of interactive dramatic experiences concerned with other socially relevant themes. The overall outcome and evaluation of the implementation of the FPV scenario based on the IDEM provided promising results, which can be used as a foundation for future applications.

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# Paper V

## Teaching Serious Issues through Player Engagement in an Interactive Experiential Learning Scenario

*Journal paper  
(Top paper award)*

*Project presented at the Future and Reality of Games Conference.  
Vienna, 2011.*

Schoenau-Fog, H. (2012). Teaching Serious Issues through Player Engagement in an Interactive Experiential Learning Scenario. In: Mitgutsch, K., Wimmer, J., Rosenstingl, H. (eds.), *Eludamos. Journal for Computer Game Culture*. Vol. 6, no 1, pp. 53-70. ISSN: 1866-6124.



Vol. 6, No. 1 (2012)

<http://www.eludamos.org>

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**Teaching Serious Issues through Player Engagement in an Interactive  
Experiential Learning Scenario**

Henrik Schoenau-Fog

*Eludamos. Journal for Computer Game Culture*. 2012; 6 (1), pp. 53-70

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# Teaching Serious Issues through Player Engagement in an Interactive Experiential Learning Scenario

HENRIK SCHOENAU-FOG

Games have traditionally been associated with the concept of 'fun', and the common understanding is that games belong to the realm of enjoyment, while education is associated with work (Gee 2005). Earlier generations of games used for education, were even dubbed 'edutainment' games, which were also based on the idea that educational games need to be fun and pleasurable (see e.g. Ito (2008)). However, it is very challenging if not impossible to teach a very serious topic like how it is to be a victim of war through the facilitation of amusement, pleasure and enjoyment.

Although games can be fun, they also mediate very engaging experiences. Engagement in digital games can thus be a powerful incitement to learn a variety of topics (e.g. Malone and Lepper 1987; Gee 2005, Jenkins and Squire 2004; Squire 2006; Shaffer and Gee 2005), and engagement is a key concept to investigate, when designing captivating games and successful learning experiences. This paper is thus motivated to explore the potentials of using the power of player engagement to let users experience an emergent narrative with a non-pleasurable content – in this case being a victim of war. When dealing with such a serious non-fun topic in a game-like experience, how can engagement be sustained?

A more detailed knowledge about the components of player engagement can thus be applied to the design of communicative interactive game-like experiences, which exploits the conventions of playfulness in mainstream games to drive participants through interactive dramatic experiential learning scenarios concerned with serious themes. Therefore this study will firstly describe the player engagement process based on findings from an earlier study by Schoenau-Fog (2011a) and focus on the components and causes of engagement in order to get an overview of the concept. Secondly, a comparison with Malone and Lepper's (1987) taxonomy of intrinsic motivation for learning will be presented. Thirdly, the identified elements of player engagement and the motivations for learning will be used as a foundation to describe the design of an interactive experiential/situated learning experience – the "First Person Victim" scenario (FPV). Finally, the study will investigate how engagement can be evaluated in such an experience and explore the potential for using the FPV as a tool in teaching.

## Player Engagement

Games have the potential to develop into novel communication formats, which are not necessarily driven by the experience of fun, enjoyment and pleasure, and in order

to harness the power of engagement in games it is necessary not only to identify the results of engagement while playing but also to explore the essential drivers of engagement.

A multitude of descriptions address related aspects of the multifaceted concept of engagement in relation to games. To mention a few scholarly studies, some descriptions are related to *motivation* (e.g. Przybylski *et al.* 2010; Malone and Lepper 1987), *immersion* (McMahan 2003; Brown and Cairns 2004; Jennet *et al.* 2008), *flow* (Csikszentmihalyi 1991) and *gameflow* (Sweetser and Wyeth 2005). Others relate to *involvement* (Calleja 2011) and *presence* (e.g. Lombard and Ditton 1997; Tamborini and Skalski 2006), and yet others to various positive emotions and feelings such as *fun* (Koster 2004; Poels and IJsselstein 2007), *pleasure* (Costello and Edmonds 2009), and *enjoyment* (Klimmt 2003).<sup>1</sup>

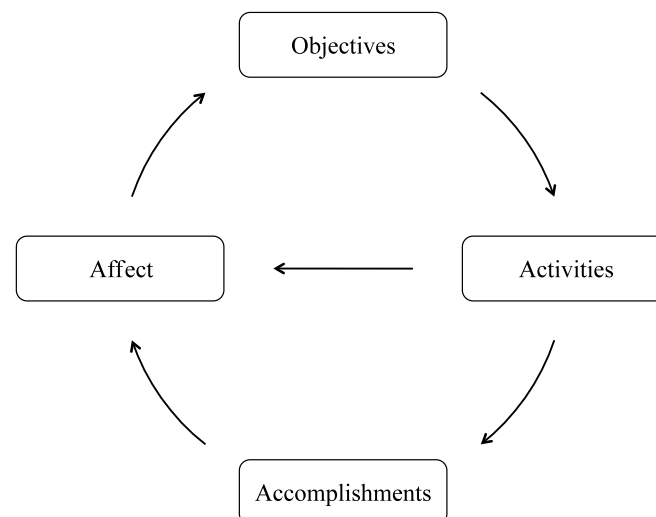
However, when players are encountering these concepts, what they experience can be argued to be supported by *continuation desire*, as the willingness to continue playing would be needed to reach deeper stages of the mentioned concepts like for example flow. When describing engagement it is therefore also necessary to investigate in detail which aspects in games *cause* players to become engaged, what makes them keep playing, and what makes them want to come back to play again.

The descriptions of the other related concepts are explaining the overall reasons for playing (motivation), the absorption while playing (immersion, involvement, presence, and flow), and the positive aspects of playing (fun, pleasure and enjoyment). An empirical investigation of continuation desire can supplement these descriptions and is necessary in order to acquire detailed knowledge about which elements of games make players want to *continue* playing. These findings can then be used to develop a framework of player engagement, which is intended to be used as a foundation for the design of experiences aimed at driving users through experiences that are not necessarily enjoyable.

In order to investigate further which elements in games trigger the desire to continue and to identify the components of player engagement empirically, 131 respondents were asked in three online surveys about their general experiences of continuation desire while playing games. The first sample consisted of 41 media technology students (33 males; 8 females; average age 23.5 years), and the open-ended questions were concerned with what it is in a game that made them want to continue playing. The answers to the open-ended questions in the first survey were analyzed and organized by the use of grounded theory. The resulting 18 categories of causes were checked through focused coding of data from two additional questionnaires (online game forums, n=48; media technology students, n=42) and compared with related concepts, such as flow, immersion, motivation and enjoyment (See Schoenau-Fog (2011a) for further explication). The categories were then used to develop a conceptual framework consisting of four components of engagement – objectives, activities, accomplishments and affect – and their causes. The framework characterizes player engagement as a progressive and cyclic activity where the player is continuously pursuing either game-defined (extrinsic) or self-defined (intrinsic) *objectives* by performing *activities*. The activities are what players report what they want to do, when they have the desire to continue playing, and these causes are: interfacing through controllers, socializing with others (e.g. by

competition, cooperation, communication, or camaraderie); solving problems and challenges, sensing the game's audiovisual and sensory feedback, experiencing the story and characters, exploring the game world, experimenting with possibilities, and creating or destroying elements in the game. While performing these activities players can experience *affect* (positive, negative, and absorption – for example pleasure, frustration or immersion) and if they *accomplish* the objective (by achievement, completion, or progression) they can also experience affect (for example by feelings of satisfaction, closure or achievement).

The resulting player engagement process (PEP) is focused on describing in detail which elements in a game cause the player to want to *continue playing during play*, while the concept of motivation describes the overall reasons of why people want to begin playing. This process can furthermore be described through the relations between the four components: Objectives, Activities, Accomplishments, and Affect as depicted in the 'OA<sup>3</sup>' framework in Figure 1.



*Figure 1: Relations between Objectives, Accomplishments, Activities, and Affect. (The OA<sup>3</sup> framework) – See Schoenau-Fog (2011a) for a detailed explanation.*

The relations in Figure 1 thus illustrate that the concepts, which are usually related to engagement – for example flow, immersion, fun and enjoyment – can be depicted as the affect resulting from the performed activities or the experiences of accomplishments while the player wants to continue playing.

In this study, the identified components and causes of continuation desire are intended to be used as a foundation for the design of interactive learning scenarios. In the following section, the framework will therefore be related to motivations for learning in games.

## Player Engagement and Motivations for Learning

When comparing the player engagement process with Malone and Lepper's (1987) taxonomy of intrinsic motivations for learning it is possible to identify the relations between the causes of continuation desire in the PEP framework and the various motivational factors from the taxonomy. The factors of individual motivation in Malone and Lepper's taxonomy are: *challenge*, *fantasy*, *curiosity* and *control* while the interpersonal motivational factors are *cooperation*, *competition* and *recognition*. In the following some examples of relations relevant to this study are described:

The factor of *curiosity* can have the potential to drive the activities of exploration, creation, and experimentation in the PEP framework, because players' curiosity set up self-defined (intrinsic) objectives (like "what if?") which can be reached by performing those activities. Sensory curiosity is related to the category of sensory engagement, where players want to continue in order to experience the game's audiovisual and haptic feedback. Cognitive curiosity can also be linked to solving problems and puzzles, as well as wanting to "fill holes" in a narrative.

The *fantasy* factor (emotional aspects, cognitive aspects, and endogeneity), can motivate the drive to experience the story and characters and lead to emotions and e.g. identification with characters. The *challenge* factor (goals, uncertain outcomes, performance feedback, and self-esteem), is for example concerned with the (extrinsic) objectives which the game set up and the player's own selfdefined (intrinsic) objectives. Control (contingency and response, choice, and power) can respectively be related to interfacing, creation, and destruction.

Finally the inter-personal motivations (*competition*, *cooperation*) can be related to the social aspect while reputation and recognition can become an affect which can be experienced after competing or cooperating with others.

The drivers which players report that make them want to continue described in the PEP framework thus corresponds with the intrinsic motivational factors identified by Malone and Lepper (1987). The main difference between the PEP framework and the motivational taxonomy is that the framework organizes the triggers of engagement in a process model while the taxonomy is concerned with requirements on how to design an intrinsically motivating learning environment. When combining the taxonomy and the framework it is possible to understand the underlying reasons of what makes players want to continue playing. For example when players have the desire to continue playing because they want to explore the gameworld, the reasons might be sensory and cognitive curiosity as well as the possibilities of choice in the controls.

This knowledge can then be used to assist in developing interactive emergent narrative tools for teaching. In order to design for engagement in such experiential learning scenarios the motivational factors suggested by Malone and Lepper (1987) can then be utilized by concretely implementing categories from the PEP framework – for example possibilities to explore, problems to solve, and triggers of intrinsically motivated objectives. The following case study will focus on how to use player engagement when designing for experiential learning.

## Case: Designing for player engagement in an interactive experiential learning scenario

In order to exemplify the application of player engagement in an experiential learning scenario, this section will focus on describing how the findings have been used in the design of the FPV application.

The purpose of the FPV is to communicate the topics of the tragic theme during a short play-through of the experience. It is thus essential that the design of the FPV is able to sustain the participants' engagement during the experience for the duration of the play-through. The engagement framework and the taxonomy of intrinsic motivations for learning have therefore been used as an inspiration to design for engagement in the application.

It is the intention of the scenario to initiate in-class discussions concerning the topics of being a victim of war and refugees. The idea is that users should have different experiences in order to get as much variety as possible when discussing the subjects. In game-based learning it is furthermore a common belief that debriefings and in-class discussions based on different experiences can enhance the learning outcomes (e.g. Squire and Jenkins 2003). Therefore the application is implemented as an emergent narrative, where users have a range of possible events to experience, and through these encounters they can construct their own individual narrative (see e.g. Jenkins 2004).

However, it is also very personal what drives users' motivations, so the idea is to trigger their desire to continue by stimulating curiosity and endogenous fantasy through common causes of player engagement, like exploration, experiencing the story and following the development of the characters. It is also important to implement a range of triggers of intrinsic objectives which can be interpreted individually by every user, for example cryptic phone calls or text-messages from other characters in need of help.

The experience places the participant in the role as a civilian in a war torn country during an airstrike, where it is possible to explore tragic and dramatic events. During the entire experience, the participant's narrative construction depends on encountering several different audiovisual events varying in tension (Fig 2). There are in total 42 events organized in six scenes, each with seven events. These events can be audio events (e.g. a phone call or cries for help), audiovisual graphical events (e.g. an exploding building), texts (e.g. sms-messages) or video recordings of real actors placed in the 3d world.



Fig. 2. (a) Meeting a smuggler. (b) Woman being harassed. (c) Rockets hit the City

An 'Interactive Drama Experience Manager' (Schoenau-Fog et al. 2010) organizes the various events by selecting the next possible events based on the users' navigation in the environment as well as causality. For each scene there is one less event to encounter, so in the first scene in an apartment it is possible to encounter seven events, in the next scene on a street there are six events and so on. The final events are all concerned with tragic endings, and users have no options for happy endings. The scenario is mediated through the game engine Unity (2011) by inverting first person shooter (FPS) conventions so it is not possible to use weapons or engage in combat. However, the participants can be shot at, hit by rockets or explosions and step on mines, but in order to let participants encounter as many events as possible before the discussion, it is not possible to die. There is no explicit goal defined by the scenario, as it is the intention to let participants define as many intrinsic objectives as possible in order to keep them engaged through the emergent narrative.

The player engagement process has been used to guide the design in the following way: The *objectives* in the experience are mainly based on participant-defined objectives and intrinsic motivation, as the participants should feel that they are in a war situation, where everything is chaos and there are no explicit goals and guidance on where to go.

The *activities* that participants can become engaged in are for example a) experiencing the story and the characters (driven by curiosity and an interest in encountering new events), b) sensing the environment (by observing (and not interacting with) the events) and c) exploring the gameworld.

There are no *accomplishments* to achieve and the experience ends at the most tragic incident without closure, for example when the participant realizes that it is not possible to help another character who is being shot.

At the same time it is also important that the resulting *affect* supports experiences of theme related feelings like e.g. shock (exploding mines), helplessness (no one to ask for help), and chaos (no indications on where to go) in order to communicate the topic.

Based on these design guidelines a prototype version of the FPV has been developed in order to explore engagement as continuation desire in the application as well as the possibilities of using the FPV scenario as a tool in teaching.

## Evaluating Engagement and Learning in the First Person Victim

Earlier tests of the FPV were conducted in a lab setting with university students and staff, and did not address the target group directly. Therefore, this study is focusing on how the prototype of the FPV would be evaluated in an actual school setting. The evaluation is focusing on three aspects, namely an exploration of the desire to continue as well as an investigation of what the participants felt and finally what they learned during the experience.



## Method, Participants and Procedure

The prototype was evaluated through a post-game online survey, in-game observations, and in-class discussions. Three different public lower-secondary schools were chosen through convenience sampling and invited to participate in the evaluation. As some of the students were under the age of 18, teachers at the three schools were contacted and they all had the option to try the prototype or watch a video with the most extreme scenes before the evaluation. All teachers then approved that their students could participate in the test. The FPV application was installed on local machines and a link to the online survey was made ready beforehand. One of the designers then introduced the FPV as a game with storytelling elements and students got a short introduction to the background of the game. During the introduction no details about the experience were explained and no statements concerned with the goal of the experience were presented. However, the theme about being a victim of war was mentioned since two of the designers are refugees from war torn countries. A warning about violent content was also given, and students were told to quit the game immediately if they felt that the experience was too disturbing. After having played for 15-30 minutes the students were told to stop, and asked to answer the online survey before they commenced with the in-class discussion guided by their teachers, one of the designers and the author.

## Post-game survey results

In total 40 students participated in the survey, 26 were female (65%) and 14 were male (35%). Their average age was 15.3 years (range 13-18 years) and the average time of game play per week was 7 hours (range 0-40 hours). Self-reported playtime of the FPV was 16 minutes in average (range 3-50 minutes), while the actual playtime in average was 25 minutes.

Since this study explores the continuation desire aspect of engagement, the assumption is that engaged participants will report that they want to continue the experience or try again when being interrupted. The responses were therefore analyzed and divided into three groups. The first group included those respondents, who did not want to try again, when they were asked to stop, the second group were in doubt while the third group wanted to continue playing. Table 2 illustrates the results and the demographics of the three groups.

Do you want to try again?	Disagree	Neither agree nor disagree	Agree
Total (n=40) (%)	32.5	27.5	40.0
Female (n=26) (65%) (%)	35.7	28.6	35.7
Male (n=14) (35%) (%)	30.8	26.9	42.3
Average Age (years)	16.1	14.8	14.9
Average Playtime per week (hours)	7.5	6.3	7.1
Average Playtime of FPV (minutes)	15.4	17.5	16.1

*Table 2. Survey results.*

In order to investigate what made respondents want to continue or not, what they felt, and what they thought they learned, the open-ended questions: “What is it that makes you want to continue / not want to continue and why?”, “What did the game/experience make you feel and why?”, and “What do you think you’ve learned?” were included in the survey. Each of the respondents’ 120 statements concerned with these questions were analyzed, grouped and counted for comparison. For example the answers related to the reasons for wanting to continue or not were organized into three categories: technical issues, game design issues and content/theme related issues.

### **Group 1: Do not want to try again**

The respondents who did not want to continue (32.5% of all), found that problems with the game design (75.9%) were the primary reasons for not continuing, by stating that there were no goals, they did not know where to go, there were no weapons, they were not able to shoot, the experience became boring due to lack of events, and finally it was hard to find the way. Technical problems (24.1%) were also the reason for not wanting to continue – primarily lagging and jerky images due to slow computers and bad graphics. Most respondents in this group stated that they did not feel anything, others felt boredom, some were confused due to the controls, one felt claustrophobic, and some felt that it was like being in a war and how it must have been to live there. 92% reported that they learned nothing related to the theme, while one learned that “That civilian towns were really bombed” (Male, 15).

### **Group 2: Neither nor**

The respondents who were in doubt if they wanted to try again (27.5% of all) were mentioning that they did not want to continue due to game design issues (68.2%) reporting the same reasons as the group, who did not want to continue and added that it should be possible to defend oneself, there was a lack of missions, and they did not know what to do. Technical issues (13.6%) were also mentioned and again the reason was lagging due to slow computers. Finally the theme/content (4.5%) was

mentioned as a reason for not wanting to continue because it was “not anything for us” (Female, 16)

In this group those who wanted to continue stated that it was due to the game design (9.1%), as they were curious to find out more and it was also due to the content (4.5%), “because one tries to be a victim, like them in those countries we hear about in the news” (Female, 15).

In this group, most respondents (55.6%) felt something related to the theme, for example: “To feel like a victim – it is not fun” (Female, 15). One feels like escaping and one felt that he was part of it. Finally some respondents felt confused due to technical problems.

Half of this group stated that they learned something related to the theme e.g. how it would be to be there for real, that war victims suffer, that bombs are exploding over civilians and that it is difficult to be in war-torn countries. The other half of this group reported that they learned nothing.

### ***Group 3: Want to try again***

The respondents who were engaged by stating that they wanted to continue the experience and try again (40% of all) reported that it was primarily due to the content and theme of the experience (54.5%) – exemplified by these statements: “Because it is YOU who are the hunted, and you are totally helpless in this situation” (Female, 14) and “it is interesting to try how it is [to be a victim of war] to be in their shoes and live like them” (Female, 14). Respondents also wanted to continue the experience due to positive elements in the game design (36.4%) where they mention the possibilities in the game, and because it was “exciting to play in another way than normally” (Female, 14). Finally positive technical issues are also mentioned – in this case good sounds (9.1%).

66.7% of the respondents from this group stated that they felt something related to the theme like excitement, shock, angst and fear. One reported, “I felt locked in, I felt bad, and I just wanted to get away” (Female, 17), but she still wanted to continue playing. Another felt helplessness “[because] you are caught in the middle of a war, you cannot do anything and you do not get any help about where to go” (Female, 14). One was “shaken and confused” and appreciated “that we are well here at home” (Female, 14). Another felt “A bit sad, because I know something like this happens in reality” (Female, 17). “It was incredible to think that other people are fleeing from this every day” (Female, 15). Others felt nothing due to the game design as this statement exemplifies: “It doesn’t make me feel anything, because I do not know what it was about [...] so I want to try again to find out how to play it” (Female, 17). Finally one wanted to continue the experience because he was feeling curious.

64.2% of this group reported that they learned something related to the theme, for example that “One feels afraid and insecure” (Female, 15), “It is hard to live in those countries” (Male, 15), and that “It is not fun to be in war” (Male, 13). 28.6% learned nothing they did not know already, while one (7.2%) “[...] Learned that I had to set up a strategy” (Female, 14).

## Observations

In order to acquire more data to compare with the findings in the survey, observations during all three sessions were conducted. The author and one of the designers walked around in the classes and observed the students playing, while recording audio and video for later analysis.

### *In-game observations*

Before the test of the prototype several students stated that they were looking forward to trying the FPV and appreciated the idea of playing a computer game as a part of their classes. It was clear that there were a number of technical problems with the prototype, and some of the schools' computers were too slow to handle the 3D content. However, it was also observed that most students were very focused on the game the first 10-15 minutes. Many students were used to games which set up the goals and some asked or shouted, "what are we supposed to do?" or "where are we supposed to go?"

During the session at one of the schools, an interaction analysis with talk-aloud recordings and no interruptions from the research personnel were conducted with two girls (14 and 15) playing together as well as two boys (14 and 15) who also played together.

The girls played for 25 minutes, and they primarily commented on what they experienced and they discussed what to try next, when setting up their own intrinsic objectives like "try to get up to that tower" (Female, 15) and which activities to perform. They also talked about technical issues (problems with the mouse), game design issues (the lack of events in their experience of the scenario and the missing weapons). They furthermore questioned what they had to do, where to go and what to look for (missing extrinsic objectives).

Affect is also encountered, when for example a rocket hits, and they both get a shock, scream and laugh afterward. They also become shocked, when a telephone rings in the game, and one girl gets annoyed and slams a hand in the table when she is being shot at. In the post-game survey the girls reported that they were in doubt if they wanted to continue because they wanted the experience to include more events and information on what to do as well as some goals or missions.

Furthermore, they reflect about the content and stated that they could identify with the person's (the refugee's) situation, and that it is impossible to go anywhere without being shot at or hit by bombs. When asked what they thought they learned in the survey, they stated: "That we are well here at home and that it is not always so cool to live there [in war-torn countries]. You cannot really walk on the streets. Your neighbors are being shot [...]" (Females, 14 and 15).

The boys who were aged 14 and 15 played FPV for 27 minutes and during their experience they comment on what they see and hear. They mainly talked about four elements: Technical issues (lagging, graphics, and comparison with other war

games), game design issues including activities and intrinsic objectives (they try to get hurt in the game, but realize that it is not possible to die, they get lost, wander in circles and it is hard for them to find the way). They also chat about external issues not related to the game, and finally they joke about the things they encounter. They reflect on the theme twice, for example when they encounter a picture of dead bodies, and one of them says that his dad also has been in a country of war and later they discuss how similar their play-through of the FPV is to a real refugee's experiences.

The boys were also in doubt if they wanted to try again. The reported reasons in the survey were that there was no goal and that the experience was repetitive. It was obvious that they were bored in the end (after having played more than 15 minutes), as one of them began to play music on his mobile phone lasting the last minutes of the test. They both reported that the experience was concerned with how it is to be a refugee, and they did not report having felt anything in particular or learned something during the experience.

Though both the girls and the boys did not clearly state that they wanted to continue or not, the recordings suggest that they all were engaged in the first 10-15 minutes of the experience because they kept exploring the world, talked about the experience of the story and characters, and they experimented with the possibilities in the game. The observations thus suggest that the experience is supporting the possibilities of player engagement through both the intrinsic objectives and the activities related to exploration, experimentation, solving problems, experiencing the story and characters. However, the observations also indicate that the lack of extrinsic objectives and enough events, which could support new intrinsic objectives, resulted in disengagement after around 15 minutes of play.

### ***Post-game observations***

In the session at the last school the students and teachers gathered in a lounge area to take a break after playing FPV. An audio recorder was placed in the room and the test personnel left the room. Analysis of the recording reveal that students and teachers initiated their own discussion and compared their experiences. In the beginning of this discussion everyone thought that they have had the same experience, but soon they realized that they had very different encounters. One female teacher even asked if it was the same game they played, as she experienced to meet a man who told her that she could get away by getting a ride on a van which was leaving the town, and none of the students had that experience. Some students mentioned that they would like to try again in order to experience more of the events mentioned by other students. This finding supports the idea behind the emergent narrative where it is the intention that participants should have different experiences.

### ***Post-game discussions***

After trying the experience students and teachers in each of the three sessions were gathered in a classroom for a discussion about the experience in order to explore the potential of using the FPV tool in teaching.

The discussion was guided by the designer, the author and teachers. A semi-structured interview approach was used and the audio from the discussions was recorded for later analysis. Students contributed actively in the discussions and some of the issues which surfaced during these discussions were suggestions for improvements related to technical problems (e.g. getting stuck in the geometry of the 3D world, lagging, problems with the controls, and blurriness that did not disappear when one got hit). There were also game design suggestions (e.g. the need for explicit goals, wishes for more people and events and more interaction possibilities, and the lack of weapons and missions. Some wanted a realistic scenario and a few wanted even more gore).

Various feelings were mentioned in the discussions and while some students just felt nothing at all, others felt hopeless, scared, shocked, lonely, frightened, powerless, and unable to do anything – “like it happens in reality” as one boy elaborated.

Students also mentioned theme related issues. For example some of them reflected on their own role in the experience: “I always thought that if I should be in a war, then it was me who should defend the others. It is the first time I see it from a point of view where I was totally helpless, and I couldn’t do anything at all. That is what I’ve learnt” (Male, 18). Others did not get more understanding on how it is to be a refugee because the scenario “could have been more lively, more realistic and with more people around.”

Some students compare the experience with other media. “This [experience] is how it would look like to walk around. [...] We just watch the TV, and we just hear that there has been a bomb explosion there or there. Now we walk around and suddenly there is a bomb exploding in front of our eyes.” (Male, 13). A girl further elaborates: “It is different, here you are experiencing it yourself [...]. It is a bit like you are deciding what is going to happen... In a film you can sit and shout ‘Don’t go down there!’ but here you can actually control what happens with this person and it is a whole different responsibility you get for this person” (Female, 14) and a boy adds to this: “[in a game] you are probably also concentrating more [than when watching a film], when you are sitting and controlling it” (Male, 13)

After the discussions, short semi structured interviews were conducted with the teachers (n=7) in order to get further feedback on the potential of using the FPV as an tool for initiating discussions about the theme. The teachers state that they observed that students had been participating actively, and especially at the last school the teachers reported that students had been more active than normally, and that some boys, who usually did not participate had been very involved in the discussion.

## Findings and Discussion

The main objective of this study is to evaluate engagement in the FPV application and the results show that 40% clearly wanted to continue playing, while 32.5% did not want to try again and 27.5% were in doubt. The survey and observations show that the engaged respondents, who wanted to try again had the desire to continue due to intrinsic objectives, activities related to exploration, solving problems,

experimentation and experiencing the characters and story. Moreover, they also wanted to continue mainly because of the theme and positive elements from the game design. The evaluation furthermore investigates the affect experienced by the students, as the mediation of feelings related to the topic is important for the communication of the theme. The engaged group reported the experience of more feelings related to the theme than both the group of respondents who were in doubt and the group who did not want to continue.

The group who did not want to continue playing reported that it was mainly due to game design issues and technical problems while feelings related to the theme were not as frequently reported as in the other groups. While most of the students in this group state that they did not feel anything in particular, the findings show that engaged students report that the FPV triggers negative feelings, which are related to the theme, and that they want to continue even though those feelings are not fun, enjoyable or pleasurable.

The findings thus suggest that this affect can be the result of the activities introduced in the PEP framework – e.g. exploration and experiencing the characters. Since there is nothing explicit to accomplish in the FPV, the affect encountered is not intended to include positive feelings such as satisfaction, triumph or closure, which is usually related to accomplishments in game experiences. However, disengagement can also be a sign of successful communication of the theme, since negative emotions related to the content can make participants not wanting to try again. For example, one teacher who did not want to continue stated that she felt afraid and powerless: “I felt a lot like a victim. [...] that loneliness... I felt bad.” (Female, 42)

When comparing the results with an earlier in-game investigation of the FPV<sup>2</sup>, which did not explore in depth what triggered the negative feelings of for example lack of power, frustration and hopelessness, the current study shows that these feelings do not only occur due to problems with controls and lack of agency in the game, but mainly due to the theme and content among the group that wanted to continue.

The way that the theme is communicated is fundamentally different than reading a book, listening to a radio-play or watching a film because the user is encountering the experiences through their own active exploration. The participants' emotions such as fear, helplessness, hopelessness, claustrophobia and angst are triggered by a (virtual) first-hand experience. These emotions might not have been communicated through non-interactive media as effective within the short time span, the application can sustain engagement (approx 15-20 mins). However, a comparison study with other media for example a short film based on the FPV is needed to investigate these differences between media.

Another goal of the evaluation in this study is to investigate the potential for using the FPV as a tool in teaching. The survey shows that the engaged students reported that they learned something related to the topic more frequently than the other groups. Moreover, a majority of the students who were disengaged state that they did not learn anything related to the theme. When discussing the experience with the classes, both students who were engaged in the experience and students, who did not want to try again participated in the discussions. Although there was a risk that the self-selective sample of the discussion could result in that only the engaged

students would contribute, the discussion showed that also students who were not engaged during the experience of the FPV participated actively. However, the factor of social expectancy could also have affected the outcome of the discussions, as students might want to answer “correct” during the interview, especially because one of the designers, who is a refugee himself, was present at the discussions.

During the post-game interviews, teachers state that applications such as the FPV could have potential in teaching as an initiator for in-class discussions about a theme. Some of the teachers mentioned that there were examples of students, who usually never contribute to discussions (especially the “quiet boys”), who took active part in the discussions after the experience.

The findings from the discussion and teacher interviews supports the idea that an in-class discussion and debriefing is important and valuable for learning as it makes learners reflect on another level, which is not always achieved during the experience. However, a comparison with a group of students who did not have a post-game discussion would be needed to verify this impression. The results furthermore suggest that the FPV can be seen as a successful exemplification of how learners in a *designed experience* (Squire 2006) can gain knowledge of serious issues by “doing and being” (ibid. p.32) in an experiential learning scenario.

## Limitations and Future Work

This study is intended to explore how the prototype of the FPV engages the students and how it would work in an actual school setting. However, further investigations are needed to generalize the findings as the overall sample was non-representative, and the results thus only apply to the three classes visited. Future studies should therefore address the limited non-representative sample size and unbalanced sample (more girls than boys). Game-literacy and game-preferences which also could have an effect on the result are not taken into account in this study, and further investigations of these parameters would also be needed to identify the relation with engagement.

The PEP framework which is used in the design of the FPV is based on responses from media technology students (n=41) and validated with a total sample of 90 respondents from online forums (n=48) and other media technology students (n=42). The framework could thus be verified further by addressing other groups of players. Other methods such as psycho-physiological measures could moreover be used to corroborate the findings concerned with the desire to continue.

The participants who did not want to continue stated that it was mostly due to errors in the prototype and the organization of the events. These findings show the limitation of the prototype, as these problems affect the desire to continue and thus the results of the survey. Further work would therefore be needed to address the technical problems and to adjust the experience through changes in the design. It is assumed that eliminating these problems could increase player engagement and thus reduce the amount of participants, who did not want to continue or were in doubt. Also the lack of extrinsic goals, closure and weapons were mentioned as having a negative impact on the desire to continue. However, as the intention is to invert conventional



first person shooter experiences in order to mediate a feeling of powerlessness, the lack of weapons, combat and competition is something that will not be changed in the next iteration of the FPV. On the other hand it could be tempting to set up an overall extrinsic objective to support player engagement – for example to flee from the town – but such a design choice could contradict the idea of the emergent narrative, where the participant should be driven by intrinsic objectives and by experiencing the story and characters through the activity of exploration while being motivated by curiosity.

Future work should also address the risk of bias, which can occur when analyzing the answers from the open-ended questions. This could be done by organizing the reasons of wanting to continue or not in categories, which could be used to acquire quantitative data. Also in-class discussions solely with teachers and students with no interference from research-personnel could be performed in order to avoid social expectancy related to the presence of the designers of the experience. Although there is an indication of a learning outcome especially among engaged students, it cannot be concluded that students indeed learned something through the self-reported learning outcomes based on the current data. Future studies could support this by investigating the knowledge of the theme before the experience, just after, and then again after a longer period. The main objectives for future research are thus to address the problems of the implementation of the FPV, to explore the learning outcomes of the experience further and to develop methods to evaluate continuation desire for example through psycho-physiological measures.

## Conclusion

In conclusion this study suggests that it is possible to use conventions from playfulness and player engagement which are usually related to enjoyable experiences to drive users through narrative game-like experiences, which can mediate unconventional content and communicate serious topics.

When designing for interactive experiential learning scenarios concerned with such issues it can be beneficial to use the PEP framework as a foundation for the design of sustained engagement by not only focusing on what it is that makes the experiences fun or enjoyable but more importantly on the triggers of continuation desire such as exploration, solving problems, experimentation, experiencing the story and characters as well as supporting intrinsic objectives through curiosity, fantasy, choice and uncertain outcomes. The results furthermore suggest that the intention to communicate a serious theme by mediating emotions and letting users encounter a range of feelings which bear similarities with that of being a victim of war has been successful especially among those respondents, who became engaged in the experience. Feedback from teachers also support the idea that there is a potential of using experiential learning scenarios such as the FPV as a tool in teaching. The findings in this study thus indicate that learning in a non-fun game-like scenario can be driven by player engagement even if the experience is not necessarily pleasurable.

## Acknowledgments

Thanks to Faysal Fuad Khalil and Jawid Faizi, both M.Sc. at Medialogy and research assistants, as well as Luis Emilio Bruni, Associate Professor at Aalborg University, Copenhagen for great teamwork while developing the First Person Victim. Acknowledgments also go to teachers and test-participants from the three schools, as well as to Lise Kofoed, Professor at Aalborg University, Copenhagen and the anonymous reviewers, whose ideas and feedback helped improve this paper.

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## Notes

<sup>1</sup> For a more in-depth literature review on the various concepts and their relation to engagement in games, see Schoenau-Fog (2011a).

<sup>2</sup> See Schoenau-Fog (2011b) for a detailed investigation of continuation desire during run time in the FPV.

# Paper VI

## Using Problem Based Learning and Game Design to motivate Non-technical Students to engage in Technical Learning

*Conference proceedings paper  
(as book chapter)*

*Presented at the Future and Reality of Games Conference  
Vienna, October, 2010.*

Reng, L, Schoenau-Fog, H. (2010). Using Problem Based Learning and Game Design to motivate Non-technical Students to engage in Technical Learning. In: GAME PLAY SOCIETY: Contributions to contemporary Computer Game Studies. Christian Swertz & Michael Wagner (eds). München : Kopaed VerlagsGmbH, 2010. pp. 27-39. ISBN 978-3-86736-240-5

# **Using Problem Based Learning and Game Design to motivate Non-technical Students to engage in Technical Learning**

Lars Reng & Henrik Schoenau-Fog

Institute for Architecture, Design and Media Technology, Department of Medialogy,  
Aalborg University, Copenhagen, Denmark

Worldwide a growing number of educational institutions are trying to meet the demands for a more humanistic focused computer scientist to solve problems related to the human factors of computing and the growing experience economy. By introducing multidisciplinary studies in the field of media technology, a broader segment of students are consequently enrolled. One of the challenges of these new educations is to motivate the artistic minded students in learning the technical aspects of the curriculum, as they need these qualifications to work in the industry. At Aalborg University's department of Medialogy, we employ problem based learning and game design to engage these students in learning the technical elements. This paper will describe our approach and exemplify the method by introducing various examples of student projects, where the interest in game design combined with problem based learning have engaged and motivated artistic students to learn technical topics on their own.

## **Introduction**

There is an increased need to educate more candidates in the fields of natural science if we are to meet the demands of the industry in just 5 to 10 years. A larger amount of students thus need to acquire a longer education within these fields of academia. Not only is there an increasing demand for employees with a longer education in computer science; the fast growing experience economy and high expectations for user friendly intuitive applications have resulted in a demand for a new kind of computer scientist: The multi-disciplinary humanistic computer scientist.

As a natural result a growing number of educational institutions are introducing multidisciplinary studies in the field of media technology. These new 'softer' computer science educations are addressing a segment of potential students that would otherwise never choose to complete a longer study in a more classical computer science education. One of the challenges for these multi-disciplinary educations is that the students are as widely spread as the range of courses covered in the curriculum. Many of the new students who apply for the education are inspired by the more humanistic or artistic courses, and have no or very little interest in learning math, programming, or other highly technical topics and consequently they focus on the contextual elements of the curriculum while neglecting the technical courses. From online job recruitment postings of various media production companies (EA Games, 2010), it is clearly shown that the industry has seen the benefit of hiring artists and designers with some level of technical understanding. Considering the number of unemployed media artists, with no technical skills it

seems only natural to appeal to this segment and attempt to combine their artistic skills with an education in the technology behind the media. Experience has, however, shown that many artistic minded students are not motivated to learn the technical aspects of the education, and therefore often fail to meet the skill level necessary to advance beyond the first semesters. The challenge of finding methods and means to motivate this potentially great asset is therefore a priority task at many educations.

## **Background**

### **Aalborg University Problem Based Learning**

For more than 35 years, the University of Aalborg in Denmark has based teaching on a special version of the Problem Based Learning (PBL) method (Busk Kofoed, L. and Kolmos, A., 2001). The method lets students learn various subjects by solving real-life problems. The PBL method was at the beginning a very risky investment, but today PBL has proven its innovative edge and made the university well known in a vast number of fields, including topics ranging from language, history, social science, psychology, biology and health to almost every brand of engineering.

The problem based learning method was introduced at Aalborg University in 1974. Like other pioneers (e.g. McMasters in 1968, Maastricht in 1972, and Linköping in 1972) the university introduced the method to educate the problem solvers of the future. Students would every semester use approximately half of the study time by solving a problem within a field selected as the overall theme of that semester. The other half of the time would be used on courses related to the topic or prerequisite for courses for an upcoming semester. Every semester the students would - independent of education - have to analyze the semester theme, find a relevant problem, develop a new theory, method or product, and after thorough testing evaluate if the problem had been solved.

The vision behind this approach is that by constantly giving the students an unsolved problem within an area they should learn, they will by themselves acquire the knowledge needed to solve the problem. The areas in which the students will search for their answers are guided by ever changing semester themes and possibly a number of supporting basic theoretical courses. It is however in the large project periods where the students push the barrier. Work is done in individual self-controlled units, supervised weekly by scientific staff sharing research topic with their groups. During the period of each project the groups define a problem and a hypothesis through analysis, develop a working product on which an academic test can either verify or disprove the quality of the new approach or theory.

Details vary between e.g. the humanistic and natural science projects and the remainder of this paper will thus focus on the structure used at the department of Medialogy at the three Aalborg University campuses in Copenhagen, Esbjerg and Aalborg.

## **Medialogy**

In order to understand the challenges of motivating students in all fields of a multidisciplinary education we will present a short description of Medialogy. The education was initiated in 2002, and was founded partly because Denmark had educated too many short educated multimedia-designers, and not enough highly educated candidates within the field of media technology with a multidisciplinary knowledge of current and future digital media. The education was placed in a field of almost uncharted waters, and has therefore undergone almost yearly optimizations. Medialogy attempts to combine artistic, humanistic, and technical topics in both courses and group based project-work, which is a major part of the education. Medialogy is a department under the University of Aalborg, and is therefore also founded on the principles of PBL which will be explained in more detail in the following section.

The above mentioned three fields of the education are maybe best described by exemplifying some of the courses that supports these. Among the content of some of the most popular and defining artistic courses are: Aesthetics and Design, 3D Animation, Audio & Video Productions, and 3D Computer Graphics Modeling; which all teaches the students theories and techniques to be artistic creative in different forms. The humanistic field is supported by courses such as Audio Visual Perception, Screen Media, and Integrated Systems Design (with Game Design and theories) which give the students an understanding of how the mind and body perceive media and the world around us.

As mentioned earlier, it is fundamentally important that all students have an understanding of how the technology behind the media works, even if they only pursue a future creating the artistic content for new media applications. The education therefore includes five different courses in programming covering fundamentals as well as; image processing, audio synthesis, 3D graphics, and artificial intelligence. All based on a foundation of the language C/C++. As for many other educations, these courses draw examples from the industry and other simultaneously run courses (artistic and technical). Unfortunately, this is not always enough to motivate all students to learn these. But here, the self-managed project work has shown some promising results.

At Medialogy the students work in self managed units of 3-6 members following the principles of the Aalborg PBL method. They have complete control of their project tasks as well as managing their time. A supervisor will once every week meet with the group to give a critical review of the latest progress of a report documenting the work, as well as advising on planned tasks for the coming weeks.

Following the Aalborg PBL method, the students will each semester get a new semester-theme and a selection of courses to support the theme. The different semesters have been designed so the students at the end of their bachelor should be able to combine all the aspects that were in focus on the earlier semesters and for example cover all elements of game development.

The problem based learning method dictates that the students' project must aim at solving a problem. The first step is therefore always to find an unsolved problem or an un-optimized area that could be improved or solved by a new approach. The study-plan furthermore requires the students to build an artifact or implement an



application that can serve as medium for a scientific test to either prove or disprove the claim that their new approach can solve the problem.

The students will formulate an initial problem statement that includes both the problem and their broad idea for an approach that could solve it. This statement serves as the foundation for a preliminary analysis and a research of both the problem area and the technologies that could support the students' approach. With guidance from supervisors the students will continue this step until enough knowledge have been gathered on every relevant aspect and sub-area, of both the problem and technical state of the art supporting the construction of the artifact, such that the group can refine their initial problem statement into a testable final problem statement. The process of refining the problem statement is done by considering a number of criteria. First and foremost the final problem statement should be phrased as a question that is both testable and can be answered based on the results of the test. The students have only two months of work to complete the entire project, it is therefore equally important to delimit the problem area, so the number of special alternate cases does not need to be tested in order to conclude.

The final problem statement then becomes the foundation for another analysis. This time the analysis is conducted with a direct focus on any knowledge needed to design and implement an artifact that will give the highest probability to solve the problem that motivated the project, and gain significant test results to support a discussion and conclusion.

Throughout the project, one of the hardest and most important skills for the students to practice is to constantly apply critical thinking. The students must at the exam be able to defend every source of information used and every decision made.

As teachers and researchers we have followed the evolution of the education of students at both Medialogy and a number of similar educations. It has come to our attention that the different way we teach also result in the students thinking in a very different way when faced with a problem. We have throughout the years seen many examples of not only innovative, but also very solid and well-designed solutions to problems and challenges within interactive entertainment and the new technology around it.

## **Problem Based Game Design**

Computer games have for decades been viewed as an un-educational distraction and therefore undesired in relation to education. But several studies and recent experience worldwide (Steinkuehler, C. & King, B. 2009), have shown that computer games might also be part of a solution to many educational problems. The mesmerizing game-play of modern computer games has captivated the interest of a large percentage of students worldwide. Experience at Medialogy indicates that students of media technology are almost unanimously fascinated by computer games.

The students at Medialogy are educated in a broad number of topics, there is however a large group of students that focus their interest on new forms of interactive entertainment and the future trends of computer games. The interaction possibilities, the strong captivating visual and audio expression of computer games

and their wide appeal makes them ideal for usage as motivational exemplifications in teaching. The entire Medialogy education is not only researching and teaching in the field of interactive entertainment; games and related media are also increasingly being used as a means of teaching. Games are often used as motivators in the daily courses that constitute the lecturing part of the teaching.

It is, however, in the semester projects that the full range of potential learning through games are reached. The skill-set needed to produce an acceptable replication of even older game titles can cover a large spectrum between psychology, human-computer interfacing, graphics programming, storytelling, modeling, animation, and even artificial intelligence (Overmars, M. 2004). Even though the teachers are using game examples to captivate the students, it is not until the students get a chance to realize their own ideas that the motivation reaches its highest. As will be demonstrated in the cases following this section, it is during the self inflicted challenge of the semester projects that even the most reluctant artistic minded student find herself deeply engaged in solving the technical problem blocking the realization of their design idea.

The usage of problem based learning adds an extra layer of motivation and forces the students to find solutions for problems blocking their way. The students will before entering the design and implementation phase of their project have undergone more than a month of research and delimiting of their goal. Through their analysis they find and specify a problem statement dictating the goal of their project. This forces them stronger than a loose design idea to solve problems instead of designing their way around them. Their monthly long analysis of the problem area also seems to increasingly motivate the students to solve the question none have done before them. Again, this is motivating them to face and address the problem, instead of turning away from it to go in a different direction.

## Results

Students at the Medialogy department at the Copenhagen campus produce about 10 new projects every semester totaling almost 60 projects a year, on the bachelor studies alone. The amount of possible case studies is therefore vast, and includes a large variety of both topics and students' skill level. The students begin at either the 1<sup>st</sup> or the 3<sup>rd</sup> semester depending on previous educations. We have therefore chosen to view two different projects made on their 6<sup>th</sup> bachelor semester, where they have at least two years of experience with following the Aalborg PBL method. Most projects are heavily influenced by the two major supporting courses: Artificial Intelligence and Integrated Systems Design (including Game Design Theories).

The authors have several years of experience with combining the PBL with game based project supervision for students on a larger multi-disciplinary education. This approach has also initiated numerous creative products, test methods, and theories finding faster, smarter, or more cost friendly solutions to products on the leading edge of technology.

The following sections will present some examples where the combination of PBL and game design has motivated students when the courses could not. It is our intention to demonstrate and explain, by example, why a motivation defined by the

students themselves turns out to be far more efficient than all of those placed by others. Also the examples will illustrate how project work based on PBL and game design can engage non-technical students in learning technical subjects, while they are researching game theories and utilizing game applications to solve their problems in innovative ways.

Two cases are presented to demonstrate how students when working on a PBL project completely controlled, managed, and executed by the students themselves; will give the motivation to push the students over the boundary that have held them back from truly engaging in learning a technical topic.

#### **Case: ‘The Sinking City of Atlantis’**

In the spring 2007 we had the privilege to teach object oriented programming to two students on their fourth semester. The former semester they had completed their first programming course but failed the exam. The students were very eager to learn and become good future designers or artists. But during a personal talk leading up to the preparations for their re-exam, they made it very clear that they never wanted to program anything in the future if they could avoid it: “We have tried, but just can’t learn it... and we never will... We just need you to teach us how to pass the exam”! It is always depressing as a teacher when a group of otherwise good students do not learn the curriculum of the course one is teaching. It is, however, far worse to see good students who have lost the belief that they can ever learn. The students passed their re-exam of the third semester introduction to C/C++ programming, but failed the object oriented programming course we were teaching on their fourth semester. We had tried our best to convince all the students - we had helped pass the first re-exam - that every university student can learn to program. The two students just could not find the motivation to study as hard as required to pass the following exam. Once again they just barely passed their re-exams.

It was almost a year later when the two students came rushing towards one of us in the hallway outside the office. They were smiling and extremely excited. Surprisingly, they had just programmed an entire computer game from scratch in a language they had learned on their own.

As part of their bachelor project, they had discovered an electronic vest that could be programmed to produce physical feedback to the user. With a motivation to conduct a test on how a device like the vest would influence the user’s behavior, they had designed a game suitable and applied to the department to purchase the vest. The project also utilized bio-feedback (pulse and galvanic skin response) to balance the gameplay.

Only then had they realized that no one in their group could actually program the game. With the introduction of the game engine Unity3D and weeks of programming practice their game “The Sinking City of Atlantis” (Atlantis) (Hägg, C. et al., 2008), was finally ready for testing, and their exams were as the game a huge success, and a clear indication that given the right motivation, even the most relented students will be able to learn computer science.



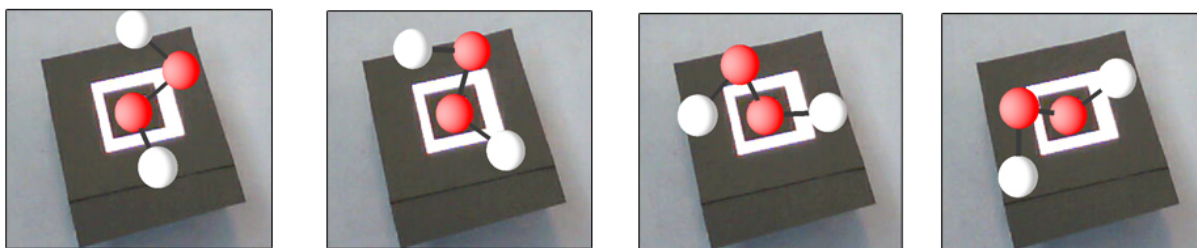
**Figure 1: ‘The Sinking City of Atlantis’ – Affective gaming with haptic feedback.  
(Hägg, C. et al., 2009)**

The two students have since moved on to and passed the master with good grades, including an internship in Australia, and have recently been visiting the Danish Film School as technical advisors for a project requiring real-time motion capture.

#### **Case: “SciVi – Augmented Reality and Chemistry”**

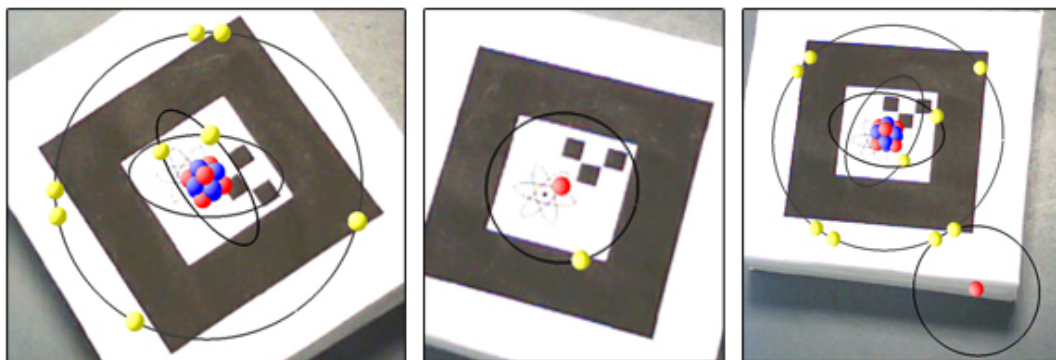
At the bachelor semester of 2008 we had a project group which consisted of some students, who were not motivated to learn programming and they were not interested in the technical aspects of the education. At the beginning of the semester the group did not know in which direction to go and were not involved in their bachelor project. However, after some guidance and initial research where the members of the group played games with head-mounted displays, they became interested in augmented reality, and a motivation to work with the technology was initiated. After more research was conducted, the group settled on analyzing the initial real-life problem “How can ‘Information and Communication Technology’ in combination with visual communication be used to supplement the teaching of Natural Science?” (Kahlil et al., 2008). After a thorough investigation of the elements of the initial problem, e.g. learning, technology’s impact on learning, collaborative learning and technology, and finally visual communication in relation to learning, the group arrived at the final problem to be solved: “How can mixed reality in a collaborative learning environment be used in the field of chemistry, to enhance the understanding of scientific modeling of molecule structures?”(Ibid) The group did an analysis of the problem, by dissecting it into methodology, chemistry, atoms, scientific visualization, animation, mixed reality, virtual reality and augmented reality, and based on the analysis result a delimitation and a list of success criteria, they designed an application which could employ augmented reality to visualize molecules in a class room environment. Due to calculations based on public schools budgets, the group delimited the solution to be run on laptops with webcams instead of utilizing head mounted displays (see fig 4a).

Suddenly these non-technical students were working with programming, state-of-the-art-technology, computer vision and augmented reality! And while implementing their design with ARToolKit (Human Interface Technology Lab, 2010), OpenGL and C++, their progress and success experiences constantly motivated them to go further. As a part of implementing the visualization tool the group implemented game elements where the goal of the game was to connect various atoms (Hydrogen and Oxygen) to form molecules of for example water ( $H_2O$ ). When the right combination was selected, the reward was that the molecule began to rotate (see fig 2).



**Figure 2: Screen shots of the animation of a  $H_2O_2$  molecule. (Khalil, F.F. et al., 2008)**

Maybe because we as supervisors challenged them, when they had implemented the molecule structure in the game, and felt that they reached their goal, they decided to enhance the solution with atomic models, where it is possible to animate a visualization from within the molecules, as seen in fig 3.



**Figure 3. The left image shows an animation representing an oxygen atom which is showing its protons, neutrons and electrons. The image in the middle is a hydrogen atom having a single proton and a single electron. The right image shows the chemical bonding between oxygen and a hydrogen atom. (Khalil, F.F. et al., 2008)**

After the group had implemented the application they contacted a school, where they conducted a test on 8<sup>th</sup> grade pupils to compare the SciVi application with other methods in the field. The pupils were divided into groups and tried to work with plastic molecule models, read a standard text book and to try the SciVi game/application – (see fig 4b).



**Figure 4 a+b: a) SciVi in action. b) Testing the visualization game at a public school.  
(Khalil, F.F. et al., 2008)**

**Even though no significant results could be made on this comparison, the group could conclude that their application was successfully implemented as a collaborative learning application.**

The development of the project SciVi documents that the no-technical students can be inspired by games, and be motivated to solve real-life problems by the use of programming and state-of-the-art technologies. At the annual Medialogy award show the project won a price, and some students from the group continued on the master, achieved top-grades, and are now working as research assistants at the department.

## **Discussion and Conclusion**

The description of the cases above illustrate how we successfully have applied problem based learning and game design in the project work at Medialogy. With these two examples it is obvious that some non-technical students managed to become motivated to apply more programming in their solutions and gather more technical knowledge during their bachelor projects, and to continue that progress through their masters. On the contrary, we have also seen cases, where other groups of students never managed to become familiar with the technological aspects of the curriculum and failed to complete their educations.

Our experience with these cases shows that supervision of projects and teaching of courses should contain three essential elements to cultivate the engagement of students:

Firstly the students need to experience that their goal of the project is to solve a problem with a purpose. For example the purpose of implementing “Atlantis” was to be innovative and to conduct some of the first research in the world to explore how the combination of balancing a game through biofeedback and at the same time to utilize haptic feedback as a part of the game play. However the goal for these students quickly became to implement the game, because it became motivating in itself to see the lines of code become moving characters on the screen controlled by the players pulse.

The students who implemented “SciVi” on the other hand found it purposeful and very motivating to work with the “real-world” 8<sup>th</sup> grade pupils as it suddenly became the purpose of the project not only to achieve a bachelor-degree, but also to help the pupils to learn about molecules and atoms in an more collaborative and interactive way.

Secondly the challenge and skills need to be balanced as in the theory of Flow (Csikszentmihaly, 1991), just like in a good game. If the challenge of solving the problem is too difficult or easy compared with the skills of the students they will loose the motivation of continuing to solve the problem. In the case of “SciVi”, the students quite early got the programming of the ArToolKit and OpenGL to work and had implemented a working prototype, but because we as their supervisors pushed them to go even further in the last phase of their project, they became motivated by using their acquired skills to challenge themselves even further to build not only an augmented animation of molecules, but also a visualization of atom structures with a game play element.

Thirdly, during the project students should be pointed in directions where they can get rewarded by success-experiences and by building up their knowledge. In the “Atlantis” project, the students became interested in using Unity 3D to implement the solution to their problem, because they had heard from us and other students that that game-engine was fairly easy to program. This was also the case, and they began to learn programming themselves with a motivation that three semesters earlier would have made their exams in programming end with a very different result. One could speculate that some of the students behind the SciVi project also got motivated to continue on the master because they had moved from being recognized as some of the weaker students to suddenly standing before all students winning a price at the annual Medialogy award show.

Through describing our experiences with employing problem based learning and game development to engage non-technical students to improve their technical knowledge in higher educations, we hope that we could inspire other educations, as well as educators to get a discussion going about how to improve the level of engagement for students in all areas of the curriculum of the new multi-disciplinary educations.

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# Paper VII

## Problem Based Game Design - Engaging Students by Innovation.

*Conference proceedings paper*  
*Presented at Think Design Play: 5th International DiGRA Conference*  
*(Digital Games Research Association)*  
*Utrecht, September, 2011.*

Reng, L, Schoenau-Fog, H. (2011). Problem Based Game Design - Engaging Students by Innovation. In: Think Design Play - 5th International DiGRA Conference Proceedings, Utrecht, DiGRA.

# **Problem Based Game Design - Engaging Students by Innovation**

**Lars Reng**

Aalborg University, Copenhagen  
Department of Architecture, Design and Media Technology  
Section of Medialogy. Lautrupvang 15, 2750 Ballerup, Denmark  
lre@create.aau.dk

**Henrik Schoenau-Fog**

Aalborg University, Copenhagen  
Department of Architecture, Design and Media Technology  
Section of Medialogy. Lautrupvang 15, 2750 Ballerup, Denmark  
hsf@create.aau.dk

## **ABSTRACT**

At Aalborg University's department of Medialogy, we are utilizing the Problem Based Learning method to encourage students to solve game design problems by pushing the boundaries and designing innovative games. This paper is concerned with describing this method, how students employ it in various projects and how they learn to analyse, design, and develop for innovation by using it. We will present various cases to exemplify the approach and focus on how the method engages students and aspires for innovation in digital entertainment and games.

## **Keywords**

Teaching, Engagement, Innovation, Development, Problem Based Learning, Interactive Media, Games, Entertainment, Social Interaction, Hologram, Multi Touch Surface, Game Balance, First Person Shooter, Real Time Strategy, Teaching.

## **INTRODUCTION**

For more than 35 years, the University of Aalborg in Denmark has based teaching on a special version of the Problem Based Learning method (PBL) (Kofoed and Kolmose, 2001). The method lets students learn various subjects by solving real-life problems. The PBL method was a relatively new approach in the seventies, but today PBL has made the university well known in a number of fields, including topics ranging from language, history, social science, psychology, biology and health to almost every brand of engineering. In 2003 the new section for Medialogy was created to meet the requirements of more highly educated students with a multidisciplinary knowledge of current and future digital media. The students at Medialogy are educated in a broad number of topics, there is however a large group of students who focus their interest on new forms of interactive entertainment and the future trends of computer games. As teachers and researchers we have followed the evolution of the education of students in this field at Aalborg University. It has come to our attention that the way PBL is applied to game design also results in students who are thinking in a constructive way when faced with a problem. We have throughout the years seen many examples of not only innovative, but also very solid and well-designed solutions to problems and challenges within interactive entertainment and the new technology around it.

The entire Medialogy education is not only researching and teaching in the field of interactive entertainment, we are also increasingly using games and related media as means of teaching.

Not all the students have a natural interest in computer science, so the development of games and other forms of interactive media is used as a motivating drive to engage the students in learning both artistic as well as technical topics. Games are also used as motivators in the daily courses that constitute the lecturing part of the teaching.

The students entering the education often have some experience in developing simple games or other interactive artefacts. The students are familiar with an approach of a much more product oriented nature, where the game development is initiated by a more or less finished design idea that through the implementation phase gets adjusted to fit the target group. The testing here tends to be either purely usability focused, functional or reduced to a level of investigating the appeal to the target group. As we hope to demonstrate through this paper, this is far from the results of a good problem based project.

## **PROBLEM BASED LEARNING**

The problem based learning method was introduced at Aalborg University in 1974. Like other pioneers (e.g. McMasters in 1968, Maastricht in 1972, and Linköping in 1972) the university introduced the method to educate the problem solvers of the future. Students would every semester use approximately half of their study time to solve a problem within a field selected as the overall theme of that semester. The other half of the time would be used on courses related to the topic or prerequisite for courses for an upcoming semester. Every semester the students would - independent of education - have to analyze the semester theme, find a relevant problem, develop a new theory, method or product, and after thorough testing evaluate if the problem had been solved.

Details vary between e.g. the humanistic and natural science projects and the remainder of this paper will thus focus on the structure used at Aalborg University, Department of Medialogy at the three campuses in Copenhagen, Esbjerg, and Aalborg.

## **Game Innovation, Medialogy PBL**

All teaching at Medialogy is conducted following the principles of the Aalborg PBL method. The students work in self-managed units of 3-6 members. They have complete control of their project tasks as well as managing their own time. A supervisor will once every week meet with the group to give a critical review of the latest progress of a report documenting the work, as well as advising on planned tasks for the coming weeks.

Following the Aalborg PBL method, the students will each semester be presented with a new semester-theme and a selection of courses, which support the theme. The different semesters have been designed so the students at the end of their bachelor should be able to combine all the aspects that were in focus on the earlier semesters and for example cover all elements of game development.

The problem based learning method dictates that the students' projects must aim at solving a problem. This approach challenges and engages the students by inspiring them to set up an objective, which they must accomplish through analysis, design, implementation, test and reflection. The first step is therefore always to find an unsolved problem or an un-optimized area that could be improved or solved by a new approach. The study-plan furthermore requires the students to build an artefact or to implement an application that can serve as medium for a scientific test to either prove or disprove the claim that their new approach can solve the problem.

### ***The initial problem statement***

The students will formulate an initial problem statement that includes both the problem and their broad idea for an approach that could solve it. This statement serves as the foundation for a preliminary analysis and a research of both the problem area and the technologies that could support the students' approach. With guidance from supervisors the students will continue this step until enough knowledge has been gathered on every relevant aspect and

sub-area, of both the problem and technical state of the art supporting the construction of the artefact, such that the group can refine their initial problem statement into a testable final problem statement. The process of refining the initial problem statement into the final problem is done by considering a number of criteria. First and foremost the final problem statement should be phrased as a question that is both testable and can be answered based on the results of the test. The students have only two months of work to complete the entire project, it is therefore equally important to delimit the problem area, so the number of special alternate cases does not need to be tested in order to conclude.

### *The final problem statement*

Defining the initial problem and more importantly the final problem statement is one of the most critical aspects of PBL, and one of the areas where the experience of the supervisor can be vital for the success of a project. It takes experience to be able to formulate a clear problem statement that is to the point and possible to investigate fully and conclude upon within the limited timeframe. Very often inexperienced students try to 'save the world' in their first projects. Problem statements like: "Can global warming be solved by making an interactive installation?" is quite common. The problem here is of course that it is highly unlikely that the project will lead to any product and test that will enable the students to conclude anything on their problem statement.

The opposite case is often found even with more experienced students. If a problem statement becomes so simple to solve that is comparable with merely performing a task, and not solving a problem, the learning outcome will be minimal. Problem statements like: "Is it possible to create a game about DNA, using computer vision?" is not only trivial to answer for anyone with a little experience in games and computer vision. More importantly, there are almost an infinite number of solutions which will solve the problem statement equally well, and the students will therefore have no means to argue for their choices or anything to prove.

A good final problem statement is one that is based on a comprehensive preliminary analysis, so 'all' solutions or partial solutions to the initial problem statements are identified and that a focus for the final problem statement is established. Final problem statements can therefore be divided into two categories:

1. Trying to solve a problem where no solution currently exists. This category could include problem statements like: "Can x be measured in first person shooter games?" (where x is something which has not been measured before) or "Is it possible to accurately measure flow in y?" (where y is an artefact which has never been implemented before).
2. Trying to find a better solution to a problem where no optimal solution exists. If a non-optimal solution exists, the students might attempt to create a product that can verify that they have a better solution, or a better solution under certain conditions. Such a problem statement could be worded like: "Can x be improved by using y?". In special cases where it can be argued by simple logic that the new approach will result in a better solution, but the new solution might have certain extra costs or negative side effects, the question to answer becomes the degree of improvement to the primary objective. A problem statement for such a project could be worded as: "To which degree can x enhance y?". The latest case is not only risky because it can often be argued that all the selected elements of the test might cause a bias, it also requires more extensive testing.

Once the final problem statement has been attuned, it becomes the foundation for another analysis. This time the analysis is conducted with a direct focus on any knowledge needed to design and implement an artefact that will give the highest probability to solve the problem that motivated the project, and gain significant test results to support a discussion and conclusion.

Throughout the project, one of the most difficult and important skills for the students to practice is to constantly apply critical thinking. The students must at the exam be able to defend every source of information used and every decision made.

Since it is the intended goal of any PBL project to force the students to attempt to solve a problem that has either never been solved before, or never been solved by that specific approach before, it can be suggested that this in itself will increase the chance of something truly innovative to emerge. No attempts are made to conclude or postulate that PBL is superior to any other teaching method. It is however a strong belief of the authors that the knowledge obtained by the students through repeated practice in PBL has the potential to result in improved problem solving in real life projects. It has not been possible to identify any cases where PBL have caused a project to fail. The concept of applying PBL is to avoid failure. The discussion is therefore not if PBL is good or bad, but whether it is worth the effort. Would the time spend on repeated in-depth analysis have been better used in development and implementation? Students repeatedly request more time for hands on implementation practice. In almost every project done, another iteration is believed to improve the quality of the final product. One of the aims of PBL is however to avoid numerous iterations leading to a local optimum almost solving the problem, when more in depth analysis earlier would lead to a more solid solution.

This paper attempts to exemplify the benefits of PBL through case studies and the following three cases will describe how students at Medialogy are being engaged through the use of PBL in their bachelor project to design innovative entertaining games and applications.

## **CASE STUDIES**

The Medialogy section at the Copenhagen campus produces about 10 new projects every semester totalling almost 60 projects a year, on the bachelor studies alone. The amount of possible case studies is therefore considerable, and includes a large variety of both topics and students' skill level. We have chosen to include three different projects made on the 6<sup>th</sup> semester, where students have at least two years of experience with following the Aalborg PBL method, because they begin at either the 1<sup>st</sup> or the 3<sup>rd</sup> semester depending on previous educations.

The project is the last of the students' bachelor studies, and they are expected to not only find a problem that lie within the semester theme, but also to include elements from as many of their earlier semesters as possible while at the same time creating an innovative solution to their problem. Most projects are heavily influenced by the two major supporting courses: Artificial Intelligence and Integrated Systems Design (including Game Design Theories).

### **Case 1: "Petri<sup>3</sup>"**

*(Attempting to enhance direct social interaction in a competitive computer game)*

Final problem statement:

*"To which degree can an immersive computer based multiplayer game support direct social interaction?"*

In the spring of 2007 a group of six students wanted to investigate if they could find a way to enhance direct social interaction in computer games (Fredslund et al, 2007). They had experienced that even if they had played a social computer game with their friends all sitting in the same room, it would be nowhere near the social experience they would get from a classic card or board game. The group began a preliminary study of games with a social aspect in general, and an analysis of the state of the art in social computer games. The students were questioning if there were some elements that computer game designers have simply 'forgotten' to use when designing. Using the PBL method, they decided to approach this problem by investigating if a computer game could be made, which would enable the same strong direct social interaction as board and card games.

After limiting their initial problem statement to focus their final problem on direct social interaction, the group began to analyze which elements would create social interaction in both board/card-games and popular multiplayer computer games. This analysis led to a comparison between the pros and cons of the two genres. One of the major findings was that players rarely take their eyes off the screen in a computer game, and the communication is therefore reduced to only speech. Facial expressions, body-language, eye contact, etc. is therefore completely missing. As the goal of the project was to investigate if the strong direct social interaction of board games could be transferred to the scene of multiplayer computer games, the group needed to specify exactly what elements of each genre would enhance such an experience. The detailed analysis led to a number of solution requirements that would work as a frame and boundary for the design process.

One of the main challenges for the group was that they wanted the players to be looking at each other as much as they would do playing a card or board game, but also at the same time take advantage of the graphical representations and information the computer games can offer. The inspiration for the solution came from fighter jets and numerous science fictions movies, as the group realized that what they really needed was a holographic representation of the game world floating between the players.

The solution was the construction of a game station with 45 degree angled glass plates what would allow the players to constantly keep eye contact while at the same time reflect four different views of the game world. This solution creates an illusion of a holographic display floating in mid air between the players. But at the same time each player can only see his own hologram, so personal information can be shown within the game world without other players being able to see it. The bottom part of the game-station was constructed with a semi-transparent glass plate and a bottom mounted web-camera facing up. This allowed the players to be using real tangible playing cards, that when placed on the table could be recognized by the computer by the use of computer vision and pattern recognition.



**Figure 6:** Picture of the ‘Petri<sup>3</sup>’ game-station during final test. Notice the hologram hovering inside the glass-pyramid between the players (Fredslund et al, 2007).

The students did a test on several four person groups, who played with the card game, in order to investigate if they could observe a high level of direct social interaction. The conclusion was that not only did the players interact socially as much as they would be doing during most card or board games, the innovative game station also created a very strong positive feedback concerning the experience from all test players.

### **Reflections**

Looking back at this project, and comparing it to some of the later attempts to combine or convert old board-games to a table-top, it seems clear to us that the focus on solving a problem forced the group of students to think out of the box. Only because the group had analyzed direct social interaction and the many levels of communication in a face-to-face conversation did they come to the conclusion that they needed to invent a low-cost holographic display to create the experience they believed would solve their problem. Even though not listed in detail in this paper, there were also numerous examples of how features of their game-play were designed to enhance direct interaction between players, as a result of the analysis of relevant card and board games. The group furthermore became engaged in solving the problem, due to the challenge of creating an innovative game interface.

### **Case 2: “Oculusia”**

*(Active collaborative gameplay on an affordable multi-touch tabletop surface by the use of PBL and iterative design)*

Final problem statement:

*“How will a co-located collaborative multiplayer game utilizing affordances of a multi-touch tabletop interface affect the player experience?”*

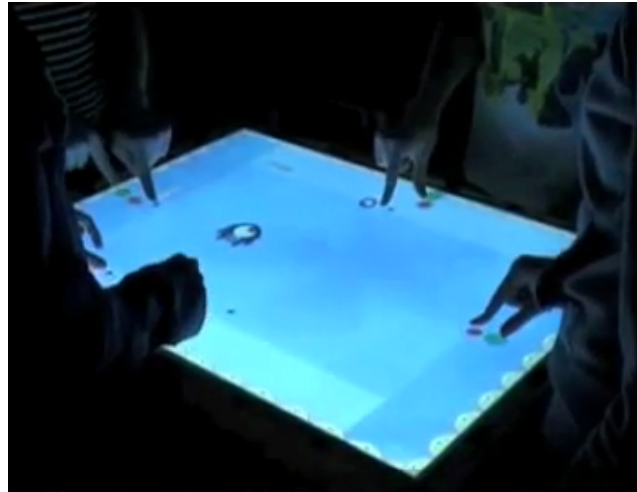
Before Microsoft Surface was released in April 2008, a group of students wanted to investigate the problem of how to make collaborative gameplay on a multi-touch tabletop surface. A part of the challenge was to create an equivalent solution to the new highly expensive multi-touch surfaces that made headlines one year earlier.

After deciding on the initial problem: “How can a computer game be created utilizing the affordances of a multi-touch tabletop interface.” (Fursund et al, 2008), an initial research was conducted with case studies of both multi-touch and touch games as well as types of gesture input. Two focus group interviews were conducted with the use of a mock-up plate instead of the digital version and the group explored which types of games the respondents could imagine would be suitable for tabletop games. The result of the case studies and the focus group interviews was a list of affordances (including some constraints), which could be used for deciding on the final problem statement. Concerning the game concept, the following affordances were found:

- Natural mapping - Close real-world physical correspondence between the players input and the graphical output.
- No haptic feedback - There is no feedback when touching, subtle visual and auditory feedback could support this.
- Occlusion of surface - With both front- and back-projected tabletops, hands can in part occlude the surface.
- Random access - Ability to access everywhere on the surface as fast as hands can move.
- Freehand drawing - The direct interaction with the surface makes it easier to control the precision.
- Handling of many objects - Large surface and direct control, makes it easier to control many objects.
- Gestures - As hands are used to interact with the table, gestures could be used to interact as well. (Fursund et al, 2008)

The social affordances became an important dimension to the project, and the following affordances were found:

- Social interaction - The confines of a shared playing field and co- location affords social interaction.
- Joint player collaboration – A shared playing field enables easy collaboration.
- Open information - All players are able to see all information, hand-held display devices could be used to communicate personal information (Fursund et al 2008).



**Figure 7:** Picture of the ‘Oculusia’ collaborative game on a multi-touch surface.

Based on these affordances the group decided that the game had to be multiplayer and it had to encourage social interaction between players through a collaborative game. The final problem was phrased as “How will a co-located collaborative multiplayer game utilizing affordances of a multi-touch tabletop interface affect the player experience?”. Through further analysis the group decided that the multiplayer gameplay should utilize multi-touch tabletop interaction affordances, be co-located, and be cooperative. Three various game concepts were then designed as paper mock-ups, each fulfilling the criteria from the final problem based on research from the preliminary analysis and a target group characterization. In this phase the group used rough game design concepts with no theme, only investigating game play and functionality. The three concepts were presented to a group of players, and through a focus group interview, the overall enjoyment of the three mock-ups were evaluated.

Through further iterations and yet another a series of focus group interviews, the final design for the game was refined and described, and further ideas from the focus group were added, thereby focusing on one concept for further development.

When the game concept’s design was decided upon, a prototype of the game was implemented by the use of Microsoft XNA and OpenCV while unstructured formative evaluations from players gave input for minor adjustments. The evaluations were conducted after every implementation and the results were discussed to try out different approaches in the next iteration.

The result of the implementation was the game “Oculusia” (Fursund et al 2008) which was a four person collaborative game. Each player should defend his or her side of the table, and shoot at the monster/boss moving around in the middle of the screen, while avoid hitting the other players on the other sides of the table.

The final test was concerned with investigating the player experience, how players interacted and played with the multi-touch tabletop platform, and how they interacted with each other. The theory behind Game Flow (Sweetser and Wyeth 2005) was used as an inspiration for the



final test. This test showed that the gameplay became more interesting and that the game became more social, playable and fun due to the many iterations.

The group also managed to get a notable press-coverage after they were mentioned in the online game site Kotaku (Fahey, 2008)

### **Reflections**

The clear defined problem statement kept the group focused on their objective through numerous of smaller iterations. A common mistake for many of our new students is to get so inspired by a single new idea after each iteration, that they end up changing their concept so far from their original idea that they have as many unsolved problems as before their first iteration. By doing a thorough analysis, and finding the goal to aim for by defining the problem in a single statement, the group became engaged in creating an innovative solution and succeeded in remaining focused, and building an impressive and well balanced game in the short period of two months. This project also suggests that the use of PBL in combination with several iterations is a valuable mixture and that it is possible to implement a stable affordable alternative to high cost technology like the multi-touch Surface from Microsoft.

### **Case 3: “Rise of the Resistance”**

*(Testing if the PBL approach can solve the FPS vs. RTS dilemma)*

Final Problem statement:

*“Is it possible to create a competitive game composed of a matchup between the First Person Shooter- and Real Time Strategy genres, which is balanced fairly, while maintaining the most important aspects from each genre?”*

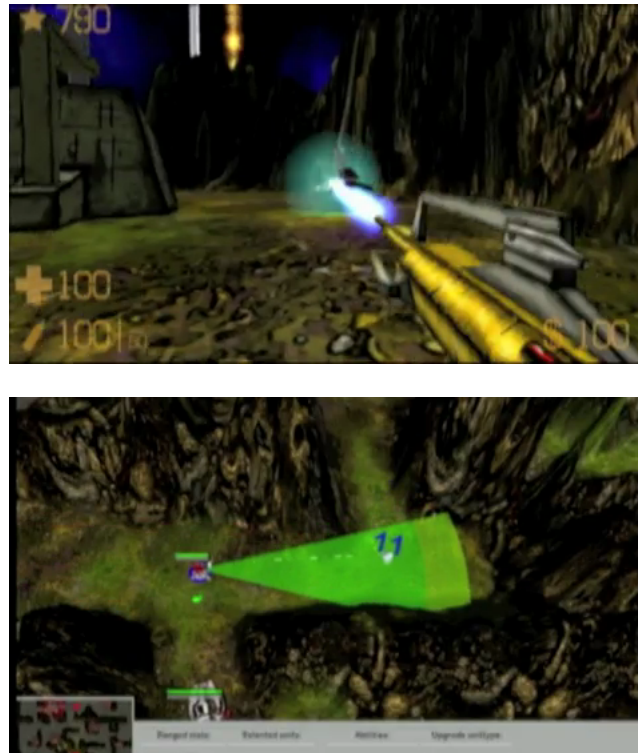
In the spring of 2010 a group of four students decided to attempt to create a solution for a problem that has caused every published game within this field to fail (Harder et al, 2010). It has for a long time been a dream to combine the two popular game genres: First Person Shooter (FPS) and Real Time Strategy (RTS) in such a way that the player can choose to enter the game as either of the two player types. Analysing the state of the art in this field, only very few published games were discovered, where the player can play the game as pure FPS or RTS without having to play some parts of the game as the other player type.

In the early preliminary analysis the students discovered that the few games able to isolate the two types in a competitive battle between FPS vs. RTS were forced to compromise so much in order to balance the strength between sides, that it no longer appealed to an experienced gamer of either type. The students decided to investigate if the use of problem based learning in the development of such a game could minimize the negative effects of the balancing compromises needed to combine the two genres.

The dilemma is that elements enhancing the player experience of one game type would decrease the experience for the other type. If all the classical traits of a RTS game were offered to the RTS player, it would make an unsuited enemy for the FPS player. The same would apply in reverse.

The first step was to analyze games and players of both game genres to detect every vital appealing game mechanic of popular FPS and RTS. A list of 20+ important game mechanics was collected for each genre through interviews and study of game literature. A final problem statement was formulated to focus on a single experiment:

*“Is it possible to create a competitive game composed of a matchup between the First Person Shooter- and Real Time Strategy genres, which is balanced fairly, while maintaining the most important aspects from each genre?”*



**Figure 8:** Two screen-shots from 'Rise of the Resistance'. (top) The view of the FPS player. (bottom) The view of the RTS player. (Harder et al, 2010).

Common for both genres is that skills should be the deciding factor in order to attract experienced gamers. It is however very different traits that appeal to the FPS and RTS player types. Based on analysis of available literature the students attempted to synthesize definitions for both genres. Their result is shown in the tables below.

Several contradicting traits had to be present at the same time. So the students came to the conclusion that an approach using several user focused iterations would have the highest possibility of a positive result. After a phase of brainstorming, mixing ideas, and re-designing, the first implementation of the game was constructed using pen, paper, and scissors. The paper cut battlefield was presented to experienced gamers of both FPS and RTS games. The response of these interviews was positive, and a number of changes were done to the game-design based on the test data. In the following month graphics, 3D models, sound recording, synthesis, and thousands lines of code were build from scratch to construct a fully functional version of the game needed for the next testing phase. The game was deliberately constructed with the aim of testing and re-balancing. Every action done by either player would be sent to a server and logged for future analysis, and game balancing parameters were stored one place in the code so that adjustments could be made in seconds.

The First Person Shooter Genre	
Challenge:	Actions:
Killing/hitting enemies	Fast and precise physical actions/reactions, which result in aiming and shooting.
Stationary/Active obstacles/Dangers	Avoiding or manoeuvring the obstacles/dangers via moving.
Managing ammunition	Choosing when to shoot and with what weapons in the players inventory.
Replenishing resources	Exploring the game world in order to find resources such as health pack and ammo.
Tactical decisions on the fly	Choosing where to move, what available weapons and possibly additional inventory items to use, very quickly as the tactical situations present themselves.
A definition element of FPS that seem to lay outside the boundaries of challenges and action is the view: It must be a first person view.	

**Figure 9:** Traits of FPS, synthesized by numerous sources (Harder et al, 2010).

The Real Time Strategy Genre	
Challenge:	Actions:
Strategic conflict	A player may choose from a large variety of potential actions or moves at most points in the game, hence victory is achieved via greater decisions/actions.
Tactical	How exactly the overall strategy is approached through explicit actions, and how well the units are managed during combat. Note that the outcome should be based on skill oppose to luck.
Logistical	Weapon production, research considerations and defending important locations etc.
Economic	Harvesting resources, and planning the rate of this harvest, while considering how it should be managed in relation to one's overall strategy.
Exploration	Manoeuvring units to locations in the game world, that are not yet revealed, while considering whether it's the appropriate time to do it.
A definition element of RTS that seem to lie outside the boundaries of challenges and action is the view: It should be a top-down view.	

**Figure 10:** Traits of RTS, (Harder et al, 2010).

A few weeks before the game was finished, the students sent around invitations, looking for experienced players of either FPS or RTS. In order to show that it is possible to mix pure FPS and RTS players in a single game their final test should not only show that it is possible to slowly shift the balance from one player type to the other. They would also have to do this while the players still believed the game was fairly balanced, and at the same time including every game mechanics that would attract experienced gamers of both types.

The final test was conducted as a nine hour long tournament where eight FPS players would battle eight RTS players. After each battle all players would fill out an online questionnaire with their experience and perceived balance between the two sides. The game would then quickly be re-adjusted based on the results stored in the database and the test-players feedback.

The results of the test did not only prove that it was possible to balance the game, it also had the effect that even though the game was still an early prototype, after nine hours of playing, the test subjects were still engaged and wanted to continue playing the game.

### ***Reflections***

This case show very clearly the difference between students attempting to create a new game based on solving a problem and just realizing an idea for a new game. The group did not have the experience or time of the creators of the games they were trying to compete against. However, instead of trying out an idea for a finished game, and repeatedly trying to brainstorm ideas to close the gaps iteration after iteration, they located the common problem for all their predecessors and approached it by using PBL. The group furthermore became engaged in solving their problem because the solution demanded an innovative approach (since no commercial companies so far had achieved a successful game combining the genres). The students have recently started a small game company, and they are currently in the process of developing new game concepts by the use of PBL.

### **DISCUSSION AND CONCLUSION**

Even though only three case studies are presented in this paper it should be noted that the reflections and conclusions are based on years of teaching and personal supervision of almost a hundred student projects. The paper is motivated by a strong belief that not only is game development through problem based learning a powerful method to engage students in many fields of computer science, it has also shown to engage and challenge students to search for innovative solutions at the boundary between the known and unexplored areas in several fields of interactive entertainment. Many of the students who begin studying at Medialogy have an educational or professional background in product based game development which affords many creative and fun ideas for new games.

The objectives of games have through recent years however gone from being purely for entertainment to more serious purposes. Games and other forms of interactive entertainment are today accepted as a serious element in teaching in all levels of education. Simulations save thousands of lives, and improve the quality of living for millions. It is therefore important to educate the future game-designers so they can develop games that fulfil a number of specific real-life problem oriented goals. This requires a strong ability to solve problems and discover innovative solutions.

Because we constantly provoke the students to step over the border to the unknown or unstable outer borders of interactive media, they are often engaged by the challenge and forced to seek innovative solutions to the problems they have chosen to solve. A product that adds no new knowledge to the field of their semester theme is considered a failure or less important product, independent of its level of fun.

Common for all of the three case studies described here is that the problem based method forced students to find a solution to a challenging problem instead of just changing their design to avoid it. By analyzing the problem area in detail before initiating the design process, they were able to include all vital elements in their game-play and hardware construction, and as a result of this, their products became a success.

We believe that PBL is not only a source to engage students through innovation, but also result in an increasable amount of stable successful innovative creations. We hope the findings presented in this paper will not only inspire educational leaders and fellow educators to learn more about PBL, but also aspire constructive discussions and future research to reveal both the potentials and drawbacks of PBL in game design.

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